Norms of Corruption in Politicians' Malfeasance*

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Abstract

To what extent can audits serve to limit patronage and corrupt networks effectively and sustainably in clientelist societies with a prevailing norm of corruption? We develop a political agency model in which office holders are motivated to reduce rent seeking behavior through re-election incentives operating via elections and audits (formal institutions), but also through reputational or self-image concerns that are influenced by the prevailing norm on corruption in their peer group (informal institutions). We show that, while the formal institutions of audits and elections have the desired direct effect of reducing corruption, they also affect informal rules of conduct, which can have unintended effects. In particular, in clientilist societies with high levels of corruption, the social concerns work in opposition to formal incentives provided by anti-corruption efforts. Applying the theory to data from Puerto Rico's anti-corruption municipal audits program, we find evidence consistent with the idea that anti-corruption measures are less effective due to social spillovers.

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1 Introduction

Most countries — including most non-fragile states in the developing world — fit the description of *clientelist societies*, characterized by a strong presence of patronage networks that facilitate the capture of government by elites and special interest groups along with dysfunctional bureaucracies (Acemoglu and Robinson, 2012; Besley and Persson, 2011; Boix, 2017). Notably, a sizeable number of countries in this group are democracies, with well established formal institutions (e.g., constitution, civil codes) similar to those of developed countries.[1] One possible explanation of this puzzle is that the clientelist societies have different norms, cultures and traditions, or *informal* institutions; across many Latin American, Asian or African societies, for example, patronage, nepotism, and gift giving are viewed as acceptable practices to sustain relationships (Nunn, 2012, 2022; Prasad et al., 2019; Köbis et al., 2018). Clientelism and high levels of corruption are arguably connected to patrimonialism, low quality bureaucracies, and a general distrust in the state (Boix, 2017; Robinson and Verdier, 2013; Anderson et al., 2015b).

A central question becomes whether and to what extent formal institutions and the law can serve to limit patronage and corrupt networks effectively and sustainably in the presence of, and possibly despite of, prevailing social norms.[2] In this paper, we study how legal institutions designed to curb corruption fare in a society where patterns of behavior are also shaped by social norms. Our model is designed to shed light on how behavior among the political class is governed by both formal and informal rules of conduct, and how the two types of rules interact. Office holders are motivated through formal incentives (elections and anti-corruption measures), intrinsic benefits, and social reputation. The model illustrates that anti-corruption efforts can have negative spillover effects in clientelist societies where corrupt behavior is the norm, which dampens the overall success of those measures.

Our theory is built on a standard political agency model in which office holders differ in their intrinsic motivation (or private benefit of rent-seeking) and are limited in their anti-social behavior by formal institutions, specifically elections and audits. Elections as formal institutions have both incentive and selection effects. Because voters rationally oust politicians that have underperformed, and politicians care about holding office, the re-election motive provides an incentive to limit the diversion of public funds. At the same time, elections also help voters to identify politicians with comparatively low pro-social types who tend to be corrupt on average. When a politician is audited and the results are disseminated, voters benefit from a supplementary source of information on the behavior of the incumbent and her type, which we show amplifies the role of elections in incentivizing politicians. Thus formal institutions serve the goal they are designed for. In addition to material payoffs, however, office holders are also concerned about their reputation among peers (or, alternatively, their self-image), following the formalization of social motives developed in Bénabou and Tirole (2006); Bénabou and Tirole (2011). Because corrupt behavior is associated with a loss of reputation or self-image, the social motive also serves to curb corrupt behavior. Overall officeholders weigh the benefits from corruption against a desire to stay in office as well as the loss of reputation or self-image in their decision making. While an audit in their own office unambiguously boosts an incumbent's

[1] Examples that easily come to mind are Italy or Greece, two wealthy industrialized countries who share their basic civil code with European neighbors such as Germany. In other parts of the world, Brazil, Mexico, and India are examples of clientelist societies, despite adequate administrative and political institutions and ongoing efforts to curb corruption and political patronage. Most of these countries are governed by a civil code originating from the Code Napoleon, and have very similar administrative states through which the code is enforced.

[2] A related question is why targeted anti-corruption efforts in many of those societies have been remarkably unsuccessful, as highlighted in the survey by Gans-Morse et al. (2018).

re-election chances provided no wrongdoing was found and therefore lowers rent-seeking, the effect of audits on social motives is ambiguous. The reputational gain primarily depends on the extent to which anti-social behavior carries a stigma and pro-social behavior provides honour (Bénabou and Tirole, 2011), which in turn is determined by the prevailing social norm, i.e., whether corruption is a majority or a minority phenomenon. Assuming that the relevant peer group of officeholders are their counterparts in similar offices (e.g. officeholders in other units or in neighboring jurisdictions), audits in the peer group constitute shocks to the prevalence of corruption and thus induce spillover effects, the sign of which depends on whether the majority of officials in corrupt or not, i.e., the prevailing social norm. In a society where corruption is "the norm", the spillover is *negative*, meaning that anti-corruption efforts elsewhere *increase* corruption at home – and thus the effects of audits as anti-corruption measures is dampened. In a society where corruption is not the norm, anti-corruption efforts affecting others in the peer group have a *positive* spillover effect – own and peer corruption are complements, amplifying the desirable direct effect of audits.

We apply the model to the context of Puerto Rico's municipal anti-corruption audits program. Puerto Rico is an excellent example for the puzzle mentioned above because: as a U.S. territory, it shares many characteristics and formal federal institutions with U.S. states. In particular, elections are fair and conducted according to international standards, and institutions aimed at curbing corruption are well designed. Yet, it is considered a clientelist society with high levels of corruption and patronage among elected officials.[3] We use a longitudinal and spatially linked dataset of anti-corruption audits in all municipal governments during the period 1987-2014 and an identification strategy based on a quasi-random assignment of the timing of audits. Our empirical results confirm that audits have their intended direct effect in that they are associated with a significant reduction in reports of corrupt violations in the home community. At the same time, however, we find substantial spillover effects of audits in neighboring municipalities. In particular, our estimates suggest that if audits take place in two-thirds of adjacent municipalities (the sample median), reported corruption levels in the home community *increase* by 10 percent. The effects are considerably larger—34 percent—for findings of corruption attributed to the municipal government leadership (mayor or vice-mayor), and are even more concentrated among experienced politicians who have been in office for more than one term: we find a substantial 51 percent increase in reported corruption attributed to long-term incumbent mayors and vice-mayors. Interestingly, the increased corruption driven by these spillovers does not appear to be associated with an increase in the incumbent mayors' electoral accountability, i.e., a corresponding decrease in re-election prospects.

Our findings are consistent with the idea that politicians are motivated by both re-election and reputation or self-image concerns and support our theoretical framework that identifies spillover effects that are determined by the prevalence of corruption. The data therefore also provide indirect evidence in favor of Bénabou and Tirole (2011)'s theory of how prosocial or antisocial actions can be complements or substitutes depending on whether stigma or honour dominates the reputational concern.[4] In particular, the finding that the spillover effects are concentrated primarily among long-term incumbents, not among first-office holders does not support explanations of the spillover based on electoral concerns. If (re)election motives were at

[3]For a summary of the growing literature on corruption and clientelism in Puerto Rico, see e.g. Atiles et al. (2022), and Bobonis et al. (2022).

[4]The social (or self-) image of office holders endogenously depends on the social norm here: while corruption is always antisocial and abstaining from corruption thus increases one's reputation (or self-image), the extent to which this happens depends on the prevailing norm, i.e., how others in the peer group behave. The idea that social norms and reputational concerns are intertwined is not new, and has been supported empirically (e.g. Kimbrough and Vostroknutov, 2016; Howe et al., 2023)

the heart of the externality, we should see first-time officeholder to react more strongly than long-term incubments with safe seats.[5] Thus, the data support the notion that motives other than re-election prospects play a key role in shaping corrupt behavior. However, in general the data do not allow us to rule out other plausible explanations for this pattern, such as the spatial displacement of corrupt activities.

This paper contributes to several strands of research. First, our findings on the extent to which social motives dampen formal incentives when the prevailing norm is corruption tie into previous theoretical work on why corruption can be self-enforcing and societies could become stuck in a high corruption equilibrium, once a critical level of malfeasance is reached (e.g. Andvig and Moene, 1990; Bardhan, 1997; Mishra, 2006; Tirole, 1996; Mauro, 2004). Similarly, we contribute to existing research on the extent to which unethical behavior is shaped by legal institutions on the one hand, and cultural norms or beliefs on the other hand. The bulk of this literature considers those factors separately, however, and we therefore have a limited understanding of their interaction.[6] Exceptions are recent contributions by Acemoglu and Jackson (2017) and Besley et al. (2019) that examine how abruptly enacting legal reforms that are in conflict with prevailing social norms can paradoxically increase illegal activities. Our model underscores the importance of the image-based motivation of politicians as a powerful determinant in prosocial or antisocial behavior, as put forward by e.g. by Andreoni and Bernheim (2009), Bénabou and Tirole (2006); Bénabou and Tirole (2011) or Hoffman et al. (2000) in the economics field, and a large literature in evolutionary biology (e.g. Nowak and Sigmund, 2005; Chudek and Henrich, 2011) and social psychology (see Anderson et al. (2015a) for a review). Here, our model is most closely related to the recent contributions of Besley et al. (2019), Jia and Persson (2020) and Graf et al. (2023) who like us use the Benabou-Tirole framework to better understand how the interconnection of formal incentives, intrinsic motivation, and reputational concerns can help explain citizens' decisions.[7] More generally, our work adds to the growing empirical research on how social motives as well as legal enforcement measures influence citizen-state relationships (e.g. Fisman and Miguel, 2007; Perez-Truglia and Cruces, 2017; Dellavigna et al., 2017).

Finally, we add to the literature on the effectiveness of anti-corruption strategies by providing a plausible explanation of – and empirical evidence consistent with – why targeted anti-corruption efforts in clientelist societies are often remarkably unsuccessful. Specifically, although anti-corruption audit programs appear to be effective at reducing corruption by public officials in the short-run, the evidence regarding the sustainability of these efforts is mixed (e.g. Bobonis et al., 2016; Finan et al., 2017; Avis et al., 2018; Finan and Mazzocco, 2021).[8] At the same time, the negative externality we identify stands in contrast with a small literature documenting that newly implemented anti-corruption audit programs can have positive spillovers, due to salience and learning (Avis et al. (2018) and Zamboni and Litschig (2018)). We discuss our findings in relationship to this literature.[9]

[5] In particular, this last empirical result is inconsistent with yardstick competition among office holders.

[6] See Finan et al. (2017) for a detailed review of these arguments and a survey of the empirical evidence. Köbis et al. (2018) provide an overview from a social psychology perspective on the relatively small literature of social norms of corruption.

[7] While Besley et al. (2019) use the framework to explain the observed dynamics of property-tax evasion in the United Kingdom, Jia and Persson (2020) study the ethnic choice of children in ethnically mixed marriages in China. Graf et al. (2023) extend the Benabou-Tirole model to allow for social norms governing the perception of extrinsic motivation, and use the framework to explain heterogeneity in blood donation patters across Europe.

[8] Gans-Morse et al. (2018), Olken and Pande (2012), and Prasad et al. (2019) provide thorough and interdisciplinary reviews of empirical studies on corruption and anti-corruption policies.

[9] Since we identify unintended consequences of anti-corruption measures when officials are motivated by concerns for reputation, our work is also related to Fang et al. (2022) who show that in order to avoid being stereotyped as corrupt, city official in China may be favoring state-owned land developers at the expense of efficient competing private developers, which could explain the recent rise in state-owned enterprises in the sector.

The paper is organized as follows. Section 2.1 develops the theoretical framework with the main results in Sections 2.2 and 2.3. In Sections 3.1 and 3.2, we apply the formal model to data from Puerto Rico. Section 4 concludes.

2 A Model of Corruption and Norm Spillovers

2.1 The Basic Framework

The model is designed to capture a situation in which corrupt behavior is governed by both formal and informal incentives. The former originate in the concern for re-election and are augmented by audits that provide public information on incumbents' behavior in office and thus affect electoral prospects. The latter operate through the social motive developed in Bénabou and Tirole (2006), where an individual's actions are influenced by how they affect her reputation or self-respect. Consider a two-period $t = 1, 2$ economy with a set $\mathbb{N}$ officeholders, each of whom is responsible for provision of a public good or service y, and chooses whether to divert public resources for personal gain while in office. Each officeholder faces a representative citizen-voter who decides on re-election after period 1. To focus on social spillover effects, we assume that although officeholders are socially aware of each other (see below), there is no other connection between them, i.e., there is no externality in public good provision or other interdependency between offices, strategic or otherwise.[10] One interpretation of our framework is that the officeholders are leading separate units as part of a larger organization (e.g., the government). Another interpretation is that those officials form the government in separate jurisdictions.

Officeholders. Consider a representative official, and let $r \in \{0, 1\}$ be her decision on diverting public funds, with $r = 1$ denoting positive rent extraction (corruption). In choosing r, the official weighs the direct benefit of rent extraction against her intrinsic motivation of advancing public interests, her chances of being re-elected, and the social reputation gain (or loss) with respect to her peers. We describe each of these aspects separately below.

In each period $t = 1, 2$, the incumbent politician receives a material payoff $R + br + \theta(1 - r)$, where $R > 0$ is an office rent, b is a fixed (monetary) benefit from corruption, and θ measures the official's intrinsic motivation to act pro-socially. θ is randomly drawn from a continuously differentiable and symmetric unimodal distribution $G(\theta)$ with mean normalized to zero and known only to the politician. Ceteris paribus, a politician with a higher motivation θ has less incentive to take a corrupt action. For simplicity, we assume that politicians care only about the material payoff in the second period. Period-2 officeholders therefore extract rents if and only if $\theta < b$. There is no discounting. Denoting by $P(r)$ the probability that a period-1 incumbent is re-elected given r, her expected period-2 payoff is

$$P(r)(R + \max\{\theta, b\}).$$

In addition to material payoffs, period-1 incumbents are concerned about how other officeholders view their intrinsic motivation θ, i.e. about their reputation in the peer group $\mathbb{P} \subset \mathbb{N}$. Following Bénabou and Tirole (2006), we model a politician's social payoff as $E_{\mathbb{P}}[\theta|r]$, which is the average type of politicians in her

[10] For example, we also rule out informational externalities that could lead to yardstick competition between office holders.

peer group who make the *same* choice.[11] For example, if very few officials in the peer group are corrupt, then $E_P[\theta|r=1]$ will be negative and very low, implying a large social cost associated with corruption. The reputation motive requires officeholders to observe each others' rent extraction, e.g., because fellow politicians have better knowledge than voters on whether an incumbent is acting to advance public interests.[12] An alternative interpretation of the formalization is self-image rather than reputation (Bénabou and Tirole, 2006), which does not require individual decisions r to be observable in the peer group, only averages.

Denoting by $\mu \in [0,1]$ the relative weight that an officeholder puts on the social motive, her preferences can be summarized by

$$u(r|\theta) = R + br + \theta(1-r) + (1-\mu)P(r)(R + \max\{\theta, b\}) + \mu E_{\mathbb{P}}[\theta|r], \tag{1}$$

(1) is maximized for $r=0$ if and only if

$$u(r=0|\theta) \geq u(r=1|\theta),$$

or equivalently,

$$\theta \geq b - (1-\mu)(P(r=0) - P(r=1))(R + \max\{\theta, b\}) - \mu(E_{\mathbb{P}}[\theta|r=0] - E_{\mathbb{P}}[\theta|r=1]). \tag{2}$$

On the left-hand side of (2) is the intrinsic motivation to act pro-socially. The right hand side is comprised of the material payoff from diverting rents, which however is reduced by the drop in re-election chances (the second term) and the loss in reputation (the third term) if the incumbent chooses the corrupt action ($r=1$) over the corrupt action ($r=0$).[13]

Voters. The representative citizen-voter cares about public good consumption y which in each period is jointly determined by the decision of the incumbent $r \in \{0,1\}$ and the state of the economy $s \in \{0,1\}$ as follows

$$y = 1 - r \cdot (1-s).$$

The realization of y is publicly observable, but the state of the economy s is not. The incumbent's choice of r is revealed to voters only through an audit. A favorable state $s=1$ will therefore 'mask' bad behavior without an audit. Conversely, the electorate will know whether the office holder took the corrupt action if the state is unfavorable, $s=0$, or if there was an audit. For simplicity, there are no other penalties associated with corruption, that is, the only punitive effect of audits work through their effect on re-election probabilities. We also assume that incumbents know whether they will undergo an audit or not, which allows us to focus on pure strategy equilibria in which officeholders are incentivized to reduce rent extraction prior to an audit.

We formalize the decision problem of voters with a simple probabilistic voting model. In addition to public good consumption as specified above, voters experience a utility shock $\delta \in \mathbb{R}$ in favor of the incumbent at the end of period 1, which is drawn from a distribution $F(\delta)$ with density $f(\delta)$. An incumbent is re-elected if and only if the sum of her popularity δ and the expected pecuniary payoff she can generate in period 2 is

[11] See also Besley et al. (2019), and Jia and Persson (2020), among others.

[12] We can easily allow for only partial observations of r, similar to Besley et al. (2019). Also recall that one period would usually cover multiple years of office until re-election, so while the actions of other politicians may be observed with a lag, it would still be within the same electoral period under consideration.

[13] We will verify $P(r=1) < P(r=0)$ and $E_P[\theta|r=1] < E_P[\theta|r=0]$ below.

larger than that of a challenger. The latter's intrinsic motivation is drawn from the same distribution $G(\theta)$, ensuring that differences in expected period-2 behavior between incumbent and challenger are solely due to voters having accumulated more information on the incumbent's type while in office. Specifically, at the end of period 1, voters observe the level of public goods y. They also have information $I \in \{\varnothing, r\}$, where $I = r$ if an audit took place in the office and $I = \varnothing$ otherwise. For a given strategy $\hat{r}(\theta)$ of the incumbent, voters use their knowledge of y and I to form rational expectations of the politician's type θ. Denoting by p the probability that $s = 1$, the expected period-2 payoff of a voter from keeping the incumbent of popularity δ in office is

$$p + (1-p)\Pr(\theta \geq b | y, I, \hat{r}) + \delta.$$

Comparing this with the expected payoff from voting for the challenger, $p + (1-p)(1-G(b))$, voters will favor the incumbent if

$$\delta \geq \underline{\delta}(y, I, \hat{r}) \equiv (1-p)\left[(1-G(b)) - \Pr(\theta \geq b | y, I, \hat{r})\right].$$

By choosing r, the officeholder determines the distribution of y and voter information I (if there is an audit), taking $\hat{r}$ as given. From her perspective, the probability of re-election as a function of r is thus the probability that $\delta \geq \underline{\delta}(y, I, \hat{r})$ or equivalently, $P(r) = E_{y,I}\left[1 - F(\underline{\delta}(y, I, \hat{r}))|r\right] \in (0,1)$.

Equilibrium. Elections in this economy serve both a disciplining and a sorting role: voters can oust candidates who have revealed themselves to be corrupt while at the same time, candidates have an incentive to behave pro-socially to manipulate voter's beliefs about their type through their choice of r and the corresponding public good level y if there is no audit. By increasing the information available to voters, audits improve voters' ability to discipline incumbents and select good candidates.

Note first that the right-hand side of (2) is independent of an officeholder's own θ. Thus, there is a cut-off value θ^* defined by

$$\theta^* = b - (1-\mu)\left(P(r=0) - P(r=1)\right)(R+b) - \mu\left(E\left[\theta | r=0\right] - E\left[\theta | r=1\right]\right), \tag{3}$$

such that the office holder's equilibrium choice of $r(\theta)$ is $r = 0$ if $\theta \geq \theta^*$ and $r = 1$ otherwise. It is easy to see (and verified below) that $\theta^* < b$, that is, incumbents with types $\theta \geq b$ always choose the non-corrupt action: they not only follow their intrinsic motivation but also increase their chances of being re-elected and their social reputation. An incumbent with $\theta < b$ on the other hand may choose $r = 1$ over $r = 0$ if her intrinsic payoff from the corrupt action b is sufficiently high.

In equilibrium, voters correctly infer the threshold value θ^* and $\hat{r}(\theta) = r(\theta)$. Voters' beliefs $\Pr(\theta \geq b | y, I, \hat{r})$ and, hence, the re-election probability of the incumbent thus depend on θ^*. At the same time, θ^* determines the average equilibrium corruption among the officeholder's peers, and therefore also influences the reputation gain (loss) from the pro-social (anti-social) action. We study each of these channels in turn.

2.1.1 Electoral Discipline and Audits at Home

We start with how the re-election chances affect the incentives of the incumbent to take the pro-social action, and how those incentives are shaped by an audit. Consider first a situation where the official knows that there is no audit, so $I = \varnothing$. If voters observe $y = 0$, they know for sure that $r = 1$ and therefore $\theta < b$.

Hence, the incumbent is re-elected if and only if her popularity δ satisfies $p + \delta \geq p + (1-p)(1-G(b))$ or

$$\delta \geq \underline{\delta}^0 \equiv (1-p)(1-G(b)) > 0. \tag{4}$$

If voters observe $y = 1$, given the officeholder's (correctly anticipated) strategy specifying $r(\theta) = 0$ if and only if $\theta \geq \theta^*$, the conditional probability of $\theta \geq b$ is

$$\Pr(\theta \geq b | y = 1, \varnothing, \theta^*) = \frac{1 - G(b)}{p + (1-p)(1-G(\theta^*))}.$$

The incumbent is re-elected if and only if $[p + (1-p)\Pr(\theta \geq b | y = 1, \varnothing, \theta^*)] + \delta \geq p + (1-p)(1-G(b))$ or, equivalently,

$$\delta \geq \underline{\delta}^1_N(\theta^*) \equiv -(1-p)^2 \frac{(1-G(b))G(\theta^*)}{p + (1-p)(1-G(\theta^*))} < 0, \tag{5}$$

where the subscript N stands for the no-audit case. Recalling that corrupt actions are disguised by a good state of economy $s = 1$ with probability $1 - p$, and that non-corrupt actions always result in $y = 1$, the officeholder's probability of re-election is

$$P_N(r, \theta^*) = \begin{cases} 1 - pF(\underline{\delta}^1_N(\theta^*)) - (1-p)F(\underline{\delta}^0) & \text{if } r = 1 \\ 1 - F(\underline{\delta}^1_N(\theta^*)) & \text{if } r = 0. \end{cases} \tag{6}$$

The change in probabilities that the incumbent is re-elected when she chooses $r = 0$ as opposed to $r = 1$ can be written as

$$\Delta^R_N(\theta^*) \equiv P_N(r = 0, \theta^*) - P_N(r = 1, \theta^*) = (1-p)(F(\underline{\delta}^0) - F(\underline{\delta}^1_N)) > 0, \tag{7}$$

confirming that considerations of electoral success motivate politicians to behave pro-socially. In what follows, we will refer to Δ^R as the *re-election motive*. For future reference, note that Δ^R_N is increasing in the cutoff motivation θ^*,

$$\frac{\partial \Delta^R_N(\theta^*)}{\partial \theta^*} = -(1-p) f\left(\underline{\delta}^1_N\right) \frac{\partial \underline{\delta}^1_N}{\partial \theta^*} > 0 \tag{8}$$

since $\underline{\delta}^1_N(\theta^*)$ is decreasing in θ^*. Intuitively, as voters correctly expect fewer incumbents to behave ethically, they take a $y = 1$ as stronger evidence of pro-social behavior and are more likely to re-elect an incumbent who delivered a good outcome. Also note that how sensitive the re-election motive is to small changes in the official's equilibrium strategy is proportional to the density of the popularity shock $f(\cdot)$, which measures how many votes are gained at the margin. Below, we will use this property to study equilibrium comparative statics.

We next show that audits have a further disciplinary effect by decreasing the chances of re-election for $r = 1$ and increasing the chances of re-election for $r = 0$. To see this, suppose the incumbent chooses $r = 1$. Since an audit always discloses r, $I = 1$ and voters know for sure that the incumbent's type is $\theta \leq \theta^* < b$. As a result, her re-election chances are identical to the case where no audit takes place but a public good level of $y = 0$ discloses corruption. Now suppose the incumbent chooses $r = 0$, which ensures that the public good outcome is always $y = 1$. When there is no audit, the voters observe $y = 1$, but are unsure whether the outcome resulted from ethical behaviour or a favorable state of economy, or both. An audit, in contrast,

allows voters to observe $I = r = 0$ directly. Knowing that the incumbent's type is $\theta \geq \theta^*$ with certainty, they will re-elect her if $p + (1-p)(1-G(b))/(1-G(\theta^*)) + \delta \geq p + (1-p)(1-G(b))$ or

$$\delta \geq \underline{\delta}_A^1(\theta^*) \equiv -\frac{(1-p)(1-G(b))G(\theta^*)}{1-G(\theta^*)},$$

where the subscript A indicates an audit. The probability of re-election is

$$P_A(r, \theta^*) = \begin{cases} 1 - F(\underline{\delta}^0) & \text{if } r = 1 \\ 1 - F(\underline{\delta}_A^1(\theta^*)) & \text{if } r = 0, \end{cases} \tag{9}$$

As is easily verified, $\underline{\delta}_A^1(\theta^*) < \underline{\delta}_N^1(\theta^*)$ for all values of θ^*. Thus, we must have $P_A(r=1,\theta^*) < P_N(r=1,\theta^*)$ and $P_A(r=0,\theta^*) > P_N(r=0,\theta^*)$ for all values of θ^*. That is,(non)corrupt incumbents' election chances fall (rise) as a result of an audit.

Let

$$\Delta_A^R(\theta^*) \equiv P_A(r=0,\theta^*) - P_A(r=1,\theta^*) = F(\underline{\delta}^0) - F(\underline{\delta}_A^1(\theta^*)). \tag{10}$$

. Noting that $\Delta_A^R(\theta^*) > \Delta_N^R(\theta^*)$, we can conclude that audits unambiguously increase the gain (loss) in expected electoral success resulting from behaving (un-)ethically, as one would expect. Again, it is straightforward to show that the expected electoral gain from a non-corrupt action is increasing in θ^* — the fewer incumbents are hiding their true type with a pro-social action in the first period, the more confident voters are that a re-elected first-period incumbent will not act corrupt in the second period — and that this effect is amplified by $f(\cdot)$, the number of votes gained at the margin.

2.1.2 Social Motive

The social component of an officeholder's preferences affects her behavior through the (implicit) comparison to the behavior of her fellow politicians. As mentioned above, we formalize this notion using the framework of Bénabou and Tirole (2006) and Bénabou and Tirole (2011) who posit that individuals are motivated by their reputation, which is (proportional to) a peer's beliefs of her intrinsic type θ, having observed a pro-social (or anti-social) action. If the group is large, this value equals the average type in the group of peers who take the *same* action as the officeholder in question. Let $\tilde{\theta}$ be the average cutoff among peers $\mathbb{P}$ (in equilibrium, we will have $\tilde{t}heta = \theta^*$). The social payoff for a given choice of r is $E_{\mathbb{P}}[\theta|r]$, resulting in a reputation gain from choosing $r = 0$ of $E[\theta|\theta \geq \tilde{\theta}]$ while $r = 1$ yields a lower payoff $E[\theta|\theta < \tilde{\theta}]$. Alternatively, we can think of this payoff as the utility from a gain (loss) in self-image. In this latter case, r does not have to be observable in the peer group. [14]

The social motive through which the behavior of other officeholders impacts the choices of an incumbent can then be subsumed by

$$\Delta^S(\tilde{\theta}) \equiv E[\theta|\theta \geq \tilde{\theta}] - E[\theta|\theta < \tilde{\theta}] > 0. \tag{11}$$

The first term of this expression represents the utility gain in reputation or self-respect (the 'honor') that the

[14] This formulation also assumes that peers care about the average motivation, and one's reputation does not vary with whether or not one's office is audited.

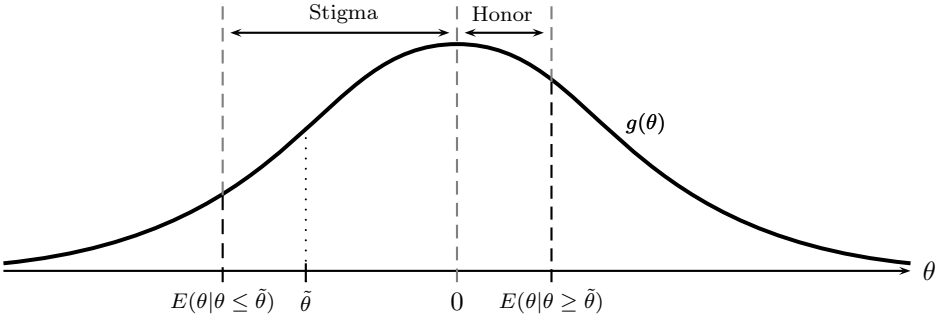


Figure 1A: society/peer group with comparatively low levels of corruption.

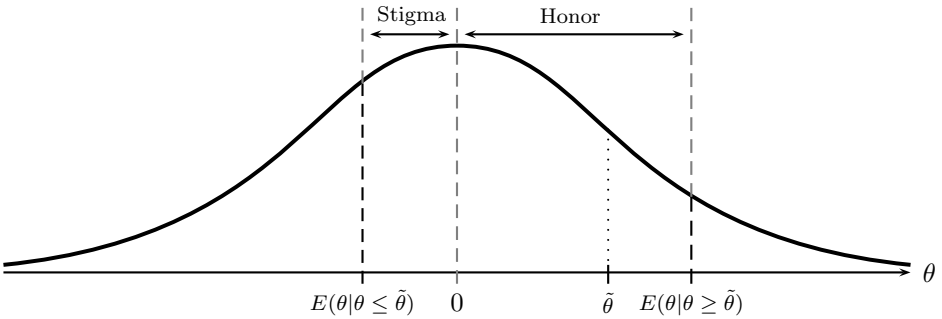


Figure 1B: society/peer group with comparatively high levels of corruption.

officeholder receives from a pro-social choice relative to the unconditional mean $E(\theta) = 0$. Conversely, the second term measures the loss in reputation or self-respect (the 'stigma') from an anti-social choice relative to $E(\theta) = 0$ (Bénabou and Tirole, 2006). Figure 1 illustrates the social motive. In Figure 1A, the majority of peers is not corrupt, i.e., $\tilde{\theta}$ is small. In such a society, the stigma of corruption is high, while there is little to be gained in reputation from conforming to the 'anti-corruption' norm. Figure 1B depicts a situation where the majority of the peer group is corrupt, i.e., $\tilde{\theta}$ is large. In societies with more corruption, there is little stigma associated with being corrupt, but there would be a significant gain in reputation from taking an anti-corruption attitude. In this range, the social motive leads more politicians to reject the (corrupt) norm in order to have themselves perceived as exceptionally good citizens.[15]

How does a change in the norm affect social incentives? Note that both conditional means are monotone and increasing in $\tilde{\theta}$. How the gain in reputation or self-image from pro-social behavior $\Delta^S(\tilde{\theta})$ changes with $\tilde{\theta}$ therefore depends on whether the honor effect dominates the stigma effect, or vice versa. Consider for instance an exogenous increase in corruption among politicians in the peer group, which corresponds to a rise in $\tilde{\theta}$. As fewer peers are behaving ethically, more honor can be gained from a pro-social choice, but the stigma from corruption falls at the same time. Whether or not the officeholder will respond with reduced or increased corruption thus depends on the sign of $\Delta^{S'}(\tilde{\theta})$.

[15]The social motive here is not related to peer pressure and a need to conform to the norm. Rather, there is a clear moral hierarchy between what is 'right' and what is 'wrong' and whether social incentives align with conforming to the norm depends on whether the majority does what is 'right'.

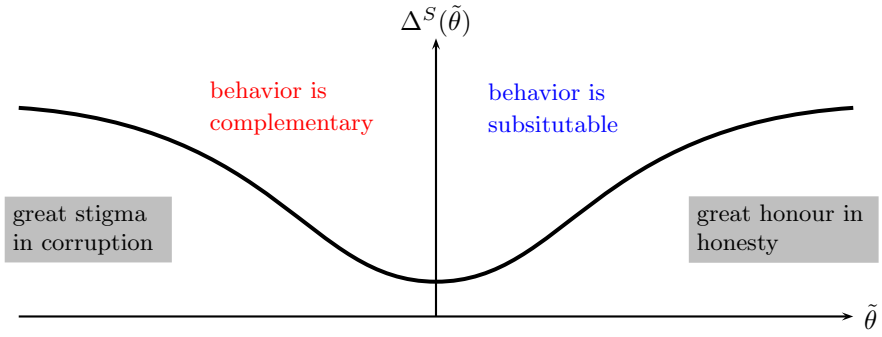


Figure 2: Reputational Pressure as a Function of Prevailing Norm $\tilde{\theta}$ in Peer Group

Figure 2 illustrates the two possibilities about the sign of $\Delta^{S'}(\tilde{\theta})$.[16] When $\tilde{\theta} = \hat{\theta} > 0$, only a small number of politicians behave ethically, a rise in corruption among peers (an increase in $\tilde{\theta}$) increases the honor of being pro-social by more than it lowers the stigma of corruption, i.e., the honor effect dominates the stigma effect. Hence, $\Delta^{S'} > 0$, and higher (lower) corruption in the peer group leads to lower (higher) individual corruption due to the social motive. Individual and peer behavior are substitutes. Conversely, when $\tilde{\theta} = -\hat{\theta} < 0$, few peers are corrupt and an increase in peer corruption does little to the honor of being pro-social but significantly reduces the stigma of corruption. Hence, the peer pressure in favor of the pro-social choice is diminished and we have $\Delta^{S'} < 0$; in this range, higher (lower) corruption in the peer group leads to higher (lower) individual corruption. Individual and peer behavior are thus complements and reinforce each other.

To see how social motives affect behavior in equilibrium, let us ignore the re-election motive for the moment ($\mu = 1$) and consider an increase in the direct benefit from corrupt behavior, b. Noting that audits play no role if behavior is solely determined through social motives, and so all offices are *de facto* identical. By symmetry, $\tilde{\theta} = \theta^*$, where the equilibrium cutoff θ^*, using (3) and (11) is determined by

$$\theta^* = b - \Delta^S(\theta^*), \qquad \text{with} \qquad \frac{d\theta^*}{db} = \frac{1}{1 + \Delta^{S'}}.$$

The term $1/(1 + \Delta^{S'})$ is a 'social multiplier'. To rule out multiple equilibria, we will focus on the case where the social multiplier is positive.[17]

If individual and social motives are substitutes ($\Delta^{S'} > 0$), the social multiplier is less than one and individual incentives are dampened by the social motive. Similarly, the social multiplier is greater than one and individual incentives are amplified through social channels if individual and social motives are complements ($\Delta^{S'} < 0$).

2.2 The Effect of Audits and Social Motives on Equilibrium Corruption

If re-election motives play a role, audited incumbents will behave differently from incumbents that are not audited, which implies different cutoffs $\theta_A^* \neq \theta_N^*$ in general whenever $\mu < 1$. Denoting by α_i the share of peers who are being audited ($i = A$) and not being audited ($i = N$), respectively, the average cutoff among

[16] Our assumptions on $G(\theta)$ ensure that Δ^S has a unique interior minimum, which is located at $\tilde{\theta} = 0$ (Jewitt, 2004).
[17] Obviously, $\Delta^{S'} > 0$ is implied if $\tilde{\theta} > 0$, i.e., if corruption is a majority phenomenon.

the peer group is $\tilde{\theta} = \alpha_A \theta_A^* + \alpha_N \theta_N^*$, with $\alpha_N = 1 - \alpha_A$. The equilibrium condition (3) can be written as, for $i \in \{A, N\}$,

$$\theta_i^* + \mu \Delta^S(\tilde{\theta}) = b - (1-\mu)\Delta_i^R(\theta_i^*)(R+b), \tag{12}$$

where $\Delta_i^R(\cdot)$ is given by (9) and (6), respectively, and $\Delta^S(\theta_i^*)$ is given by (11). Under mild conditions, we can prove the existence of equilibrium cutoffs (θ_A^*, θ_N^*) defined by (12) such that the office holder chooses

$$r(\theta) = \begin{cases} 1 & \text{if } \theta \geq \theta_i^* \\ 0 & \text{otherwise.} \end{cases}$$

We relegate the proof to the appendix. To begin with, we confirm that audits have a direct negative effect on the corruption of office holders. From (12) it is immediate that due to $\Delta_A^R(\theta^*) > \Delta_N^R(\theta^*)$ for all θ^*, we must have $\theta_A^* < \theta_N^*$. Hence,

Proposition 1 (**Equilibrium Corruption and Audits at Home**). *In equilibrium, average corruption among officeholders who know that they face an audit is lower than among officeholders who are not being audited:* $\theta_A^* < \theta_N^*$.

As explained in the introduction, the main purpose of our analysis is to gain some understanding of spillovers in corruption, if the channel that connects outcomes among peers is reputational concerns and social norms. Our next step is therefore to derive comparative static predictions of the model for the case where the number of audits among peers, e.g. in other units or jurisdictions, changes.[18] In doing so, we consider the effect of an external shock (more audits among peers) on the equilibrium behavior of incumbents. Since the social motive does not depend on voters' behavior and re-election probabilities, the only factor through which an officeholder's social norms payoff affects her choice of r is the difference in the average (or expected) type of politician who behaves pro-socially compared to the corresponding average type of corrupt politician, $\tilde{\theta}$.

Consider a small relative increase in the number of audits in the peer group, corresponding to an increase in α_A. In the short run, when the audited officeholders in the peer group have changed their behavior, the effect on $\tilde{\theta}$ is simply $\partial\tilde{\theta}/\partial\alpha_A = \theta_A^* - \theta_N^* > 0$. In the long-run, θ_A^* and θ_N^* will adjust to new equilibrium values because all officeholders experience a decrease in their peers' corruption.

Proposition 2 (**Spillovers in Corruption through Social Motives**). *The effect of reduced corruption through audits among peers depends on the social norm* $\tilde{\theta}$*:*

a) If the norm is that the majority of politicians are corrupt, namely $\tilde{\theta} > 0$*, then relatively more audits among peers increase officeholders' corruption in the short run and the long run – peer and own corruption are substitutes.*

b) If the norm is that the majority of politicians behave pro-socially, namely $\tilde{\theta} < 0$*, then more audits among peers will decrease officeholders' corruption in the short run – peer and own corruption are complements. In the long run, the spillover effect of audits is ambiguous: more audits among peers can decrease or increase own corruption.*

[18] As mentioned earlier, we are not interested in strategic interactions, and thus want to think of each office as being very small relative to the group.

Moreover, the short-run spillover effects of corruption through social norms are more pronounced (in either direction), the less sensitive re-election chances are to office holder behavior, i.e. the smaller $f(\cdot)$.

Thus, when a majority of politicians is corrupt, the norm motive causes the spillover effect of audits to be negative: more corruption-reducing measures elsewhere causes home politicians to become *more corrupt* because it diminishes the honor of behaving pro-socially. When a majority of politicians are not corrupt, in contrast, the spillover effect is positive and audits elsewhere *reinforce good behavior*. The last part of the proposition states the magnitude of the spillover effect is decreasing in the sensitivity of voters to incumbent behavior as measured by the density of the popularity shock $f(\delta)$. This is intuitive, as an office holder whose re-election chances are not very sensitive to his behavior will put relatively less weight on the re-election motive. In the extreme case where $f(\cdot) \to 0$, the spillover effects would be largest because only the social norm motive would operate ($\Delta_i^R \to 0$).

2.3 The Effect of Audits and Social Motives on Re-election Chances

To conclude our analysis, we briefly study how audits affect the selection of office holders in equilibrium. We already established in Section 2.1.1 that audits lower the odds of electoral success for corrupt incumbents and vice versa for pro-social incumbents, thereby mitigating equilibrium corruption. The overall effect on *ex ante* re-election probabilities, however, is indeterminate. Formally, using the fact that $r(\theta) = 1$ if and only if $\theta \leq \theta_i^*$, the ex ante re-election probability of an office holder can be written as

$$E[P_i(r, \theta_i^*)] = G(\theta_i^*)P_i(r = 1, \theta_i^*) + (1 - G(\theta_i^*))P_i(r = 0, \theta_i^*) \tag{13}$$

And therefore, after some manipulations,

$$E[P_A(r, \theta_A^*)] - E[P_N(r, \theta_N^*)] = (E[P_A(r, \theta_N^*)] - E[P_N(r, \theta_N^*)]) + (E[P_A(r, \theta_A^*)] - E[P_A(r, \theta_N^*)]) .$$

The first term $E[P_A(r, \theta_N^*)] - E[P_N(r, \theta_N^*)]$ on the right-hand side represents the sorting effect of audits, while the second term $E[P_A(r, \theta_A^*)] - E[P_A(r, \theta_N^*)]$ captures the disciplinary effect of audits. The signs of both effects are indeterminate. To see this, consider first the sorting effect. On the one hand, politicians who remain corrupt even in the face of an audit are more likely to be ousted from office when voters can observe r. On the other hand, politicians that took the pro-social choice are now more likely be re-elected because voters are more confident on their type. The disciplinary effect is equally ambiguous: while audits cause corruption to go down ($\theta_A^* < \theta_N^*$), which generally improves ex-ante re-election rates, voter confidence on electing a pro-social type drops as more incumbents take the non-corrupt action, which tends to diminish electoral chances. It is therefore not possible to make any general statements on how audits affect observed re-election probabilities.

It remains to examine how audits among peers spill over into re-election chances. We already saw in Proposition 2 that the impact of more audits among peers on own corruption $d\theta_i^*/d\alpha_A$, depends on the sign of $\Delta^{S'}$. Note that there is no effect of audits elsewhere on re-election rates other than through their effect on the equilibrium level of own corruption, θ_i^*.[19] To see how this translates into re-election rates, we can

[19] This would be different in a yardstick competition model, where the levels of corruption elsewhere directly influence the quality of information available to one's own electorate.

take derivatives of (13) with respect to θ_i^*:

$$\frac{dE[P_i(r,\theta_i^*)]}{d\theta_i^*} = -g(\theta_i^*)\Delta_i^R(\theta_i^*) - [pG(\theta_i^*)\cdot \mathbb{I}_{i=N} + (1-G(\theta_i^*))]\, f(\underline{\delta}_i^1)\frac{d\underline{\delta}_i^1}{d\theta_i^*}, \tag{14}$$

where $\mathbb{I}_{i=N}$ is the indicator function for $i = N$, i.e., $\mathbb{I}_{i=N} = 1$ if $i = N$ and $\mathbb{I}_{i=N} = 0$ if $i = A$. The first term of $dE[P_i(r,\theta_i^*)]/d\theta_i^*$ is always negative, and represents the selection effect of elections. Higher levels of corruption reduce the expected probability of office holders winning re-election because a corrupt incumbent is re-elected less often than a pro-social incumbent. The second term captures an information effect, i.e. how average electoral fortunes change as voters take increased corruption into account when evaluating public good outcomes and interpret positive information as better evidence of pro-social behavior. The sign of this effect is always positive, regardless of whether (i) the incumbent is not audited and the favorable information is conveyed by good public good outcomes or (ii) the incumbent is audited and the favorable information is that no evidence of corrupt behavior was found. In either event, the fewer peers act pro-socially, the more precise is a positive signal and the more confident voters will be that favorable evidence signifies a pro-social type. Hence, $\partial\underline{\delta}_i^1/\partial\theta_i^* < 0$, $i = N, A$.[20] Thus, the overall effect on re-election probabilities is again ambiguous.

Summarizing the discussion above and noting that own corruption θ_i^* depends among other things on average corruption among peers, we can state:

Proposition 3. *[Audits, Social Norm Spillovers, and Re-election Chances] Although average corruption unambiguously drops as a result of an audit, equilibrium re-election rates in audited offices may be higher or lower than in offices that are not audited,*

$$E[P_A(r,\theta_A^*)] - E[P_N(r,\theta_N^*)] \gtrless 0.$$

That is, audits and the associated lower levels of corruption do not necessarily translate into elevated chances of electoral success for incumbents.

The spillover effects of audits are ambiguous as well, and will depend on i) whether individual and social motives are substitutes or complements (the sign of $\Delta^{S'}$), and (ii) whether the selection effect of elections dominates the information effect.

Consider for example the case of norms as substitutes, $\Delta^{S'} > 0$. In this situation, the spillover effect from peer audits is negative: own corruption increases. This elevated corruption will lower equilibrium re-election rates if the likelihood that corrupt politicians are ousted is larger than the increase in the likelihood that 'lucky' (but corrupt) incumbents win re-election due to increased information reliability. Conversely, if the latter information effect dominates, re-election rates will rise ex ante *despite the fact that any given incumbent is more likely to be corrupt.*

How the magnitude of any short-run spillover effect will depend on how sensitive the electorate is to office-holder behavior is generally also ambiguous: on the one hand, incumbents whose popularity means that they need to pay less attention to the electorate will react more strongly to any given drop in corruption among peers; at the same time, their re-election chances are less sensitive to their behavior. For cases where voters are highly insensitive to behavior, the latter will dominate of course: as $\psi \to 0$, even a significant change in

[20] See Appendix A for a formal derivation.

corruption as a result of norm spillover will not alter re-election rates.

3 Empirical Application

In this section, we apply our model to data on municipal audits in Puerto Rico. As we argue below, Puerto Rico is a prime example of a country that enjoys high quality formal institutions designed to curb corrupt behavior while at the same time suffers from norms of corruption. The theoretical model has several implications we are interested in bringing to the data. First, audits have a disciplining effect on corruption: officeholders who are facing an audit reduce corrupt behavior (Proposition 1) which does not necessarily increase re-election success, however (Proposition 3). Second, and more importantly, there are spillover effects of corruption through the social motive. In particular, if the majority of politicians in the peer group is corrupt, then individual and social motives are substitutes and the spillover effect is negative: social pressure to act pro-socially decreases and corrupt behavior therefore increases if there are more audits (less corruption) in the peer group. The converse is true if the majority of politicians are non-corrupt, at least in the short run (Proposition 2). The effect on re-election rates is again ambiguous. Lastly, we expect the spillover effect to be stronger (weaker) for incumbents whose re-election chances are less (more) sensitive to their behavior/observable outcomes while in office (Propositions 2 and 3).

3.1 Context, Data, and Methodology

Patronage, clientelism, and corruption have been salient features of Puerto Rico (PR)'s modern history: the territory is considered a quintessential example of a clientelist society, both among scholars and the general public (Pantojas-García, 2015; Atiles et al., 2022). Corruption in local governments takes diverse forms and is typically based on procurement fraud, such as illegalities in auctions and in other forms of contracting, as well as over-invoicing. Public corruption can also manifested itself in the illegal hiring and firing of employees due to political patronage or nepotism or diverting resources for personal purposes. For more details on these forms of corruption as well as examples, see Bobonis et al. (2016).

Like higher levels of government, municipal politics in PR are controlled by two political parties, Partido Popular Democrático (PPD) and the pro-statehood Partido Nuevo Progresista (PNP). The elected positions consist of the mayor and members of the local assembly, all elected for a four-year term following the Commonwealth (and U.S. federal) government electoral cycle. The elected mayor appoints the top management of the municipality. There are no term limits for mayors nor for members of the municipal assembly. As a consequence, in municipalities where one party heavily dominates the political landscape, incumbent mayors tend to remain in office for long periods of time.

Similar to the rest of the United States, municipal governments possess a certain degree of autonomy. Although their responsibilities are generally limited to public health services, infrastructure, and solid waste management, there is some heterogeneity in governments' capacity to raise tax revenue and manage expenditures. Despite the high prevalence of malfeasance – 64 percent of the audits in our sample reveal evidence of corruption – technocratic anti-corruption efforts via the Office of the Comptroller of Puerto Rico ("OCPR")'s anti-corruption audit program, are reasonably effective. This is particularly the case in more politically competitive jurisdictions (Bobonis et al., 2016).

The OCPR Municipal Government Auditing Program. The Office of the Comptroller of Puerto Rico

("OCPR") is an autonomous government agency with a mission to "audit the property and public funds transactions with independence and objectivity to determine if they have been done in accordance to the law[, and] promote the effective and efficient use of the government resources [...]" (Office of the Comptroller 2009). The OCPR has been carrying out audits on municipal governments, producing and disseminating reports on corrupt activities, uninterruptedly since 1953.

The audit process is thorough and designed to minimize biases in the conduct of audits and in the dissemination of findings. In addition to looking for discrepancies within government documents and accounts, highly trained auditors perform inspections on public construction work and the delivery of public services, and conduct interviews with municipality officials and local community members. At the end of the process, a final report is issued and disseminated to the media. Depending on the size and complexity of the municipal government, the OCPR may publish multiple reports on a municipality for one auditing period. Importantly, the formal framework that governs the OCPR as an institution to hold government accountable has several features ensuring the integrity of the process. First, the constitution guarantees autonomy from the rest of the central government through the appointment of the Comptroller by the governor of Puerto Rico for a ten-year term. Second, the OCPR is accountable only to the two legislative chambers, but not the executive branch. Third, auditors are selected through a public process, earn highly competitive salaries, and receive extensive training. Lastly, in order to reduce individual conflicts of interest, auditors are prohibited from participating in audits of their municipality of residence.[21]

According to the OCPR's constitutive legislation, municipal governments are to be audited every other fiscal year. However, due to the OCPR's resource constraints, in reality these audits generally take place three to six years apart. Since municipalities are audited following a pre-specified order. Audits are thus anticipated, which allows us to recover behavioral responses in the data. Once all municipalities have been audited, a new auditing round takes place following the same pre-specified order.

Data. Our main units of interest are 78 municipalities in Puerto Rico, which we observe over 7 election cycles from 1988 through 2012. We source the data on municipal audits from reports published by the OCPR between 1987 and 2014. During this period, all municipalities were audited multiple times.[22] The reports contain information for roughly 86 percent of all municipalities-by-electoral term units of analysis. Each report contains a list of findings identified as the misuse of public funds, a detailed description of each finding, the individuals involved (if identifiable), and the reason(s) why it is considered a finding. Since the OCPR does not classify findings as instances of corruption, we code ourselves whether a finding constitutes an act of corruption, defined as "an act by any municipal employee that led to a *personal* financial or political benefit.[23] Corrupt acts identified through the audits are typically based on a combination of procurement fraud, the use of fake receipts (i.e., 'phantom' firms), the illegal hiring of employees, and over-invoicing the value of products or services, or simple diversion of resources for personal gain. We then combine all corrupt acts into a single measure by summing up the number of times each one of these irregularities appears. To account for the fact that larger, more complex municipalities often require multiple reports in a given auditing period, the total number of corrupt violations is normalized by dividing the count of violations by the number of reports issued. We also construct a separate index of violations per report attributed exclusively to the municipal government leadership: the mayor or vice-mayor. The municipal-wide index

[21] Bobonis et al. (2016) provides a detailed description of the audit process and its institutional details.

[22] The structure of the audits and the audit reports are only consistent starting from the mid-1980s onward. We therefore restrict our sample to jurisdictions with audit reports starting in 1987.

[23] See Bobonis et al. (2016) for a more detailed description of this coding process for a smaller but overlapping dataset.

and the mayor/vice-mayor only index are the two main measures of corruption (in a given municipality and auditing period) we focus on.

To connect audits to electoral outcomes, we obtain election data from the P.R. State Electoral Commission (CEE) containing the results of municipal and statewide ballots for the 1988-2012 elections. With this data, we observe whether the incumbent mayor runs for re-election in the general election, whether she is re-elected, the vote share and win margin for the election, her political party affiliation, whether she is in the opposition to the party in power at the state level, and her number of terms in office. [24]

We present descriptive statistics of these audit outcome variables in Appendix Table B.1, Panel A. Sixty-four percent of audit reports contain at least one corrupt violation. Thus, the majority of municipalities experience corruption. We observe on average 1.18 corrupt violations per report; however, there is substantial variation (the standard deviation is 1.64). Approximately 38 percent of these findings (0.45 violations) are attributed directly to the mayor or vice-mayor. Panel B reports other relevant characteristics, such as the number of reports from the audit, the time span of the audits, and our measure of adjacent timely audit exposure. The reports span an auditing period of 4.76 years on average.

Appendix Table B.2 contains descriptive statistics on electoral and socioeconomic characteristics. From the electoral outcomes in Panel A, we note that although 78 percent of incumbent mayors run for re-election, both incumbent mayor re-election rates (conditional on running) and overall party success rates are quite low, at 28 and 34 percent, respectively. Panel B reports other characteristics of incumbent mayors. Incumbents are split roughly equally between the two major parties, PNP and PPD. 36 percent of mayors are affiliated with the party in opposition to the party of the governor in office at the time, and approximately 44 percent are in opposition to the party of the governor who appointed the current Comptroller. Incumbent mayors remain in office for just over one term, on average, but there is substantial variation: 41 percent of incumbents have been in office for two or more terms and 20 percent for three or more terms.Moreover, the average incumbent mayor's winning margin in the previous election is 3 percentage points. We capture heterogeneity in seat safety by constructing a summary measure of party incumbency advantage: an indicator variable equal to one if the party has controlled the mayoral seat for the past three terms and zero otherwise. Based on this measure, a considerable proportion of seats (57 percent) have a strong party incumbency advantage. In Panel C, we present summary statistics for municipality characteristics based on the population census and municipal unemployment rates during the first two years of the incumbent's term.

Methodology. Following Bobonis et al. (2016), we leverage the disciplining effects induced by the timing of municipal audits for our identification strategy. We define *timely* audits as audits that are disseminated in the two-year period before an election. Conversely, *untimely* audits are those disseminated in the two-year period following an election. We expect audit reports released in the period leading up to an election to be more relevant to incumbent officeholders – and thus have a larger incentive effect – than those reports published shortly after an election.[25] This expectation is confirmed in the data. Figure B.1 in the Appendix

[24] Other basic socioeconomic municipality-level characteristics come from the 1990 U.S. Census of Population for Puerto Rico and U.S. Department of Labor Local Area Unemployment Statistics: the proportion of adults (ages 25 and over) with schooling attainment levels of high school education or more, with a college education or more, the municipality's household median income and poverty ratio for 1989, and municipality-level annual unemployment rates.

[25] This assumption is reasonable for various reasons in this context. First, the information from untimely audits may be of less relevance in future elections due to the low overall re-election rate of mayors (34 percent). Second, the media may invest more resources in disseminating audit results or the information may be more salient to voters because the information contained in audits may be of greater immediate interest to voters when an election is looming. Relatedly, even if the information from untimely audits does reach voters, they may not use it during the subsequent election because of recency bias – the tendency for

plots the average number of corrupt violations (per report) during each of the previous two electoral terms, and in the following electoral term, for municipalities in election year t. We show the trends separately for municipalities with timely (red line) and untimely (green line) audits. There are no discernible differences in the levels of reported corruption across these two groups of municipalities in earlier years and the differences are statistically indistinguishable from zero. In contrast, around election year t there is a stark difference of 0.56 violations per report. In the following year $t+1$, the difference decreases again, illustrating how timely (as opposed to untimely) audits strongly mitigate corruption, at least in the short-run.[26]

Our empirical strategy builds on the fact that municipalities are audited in a pre-established and fixed order, which is independent of the electoral cycles. The timing of audits is therfore exogenous and whether a municipality experiences a timely or an untimely audit is plausibly quasi-random. Therefore, timely versus untimely audits measure variation in anticipated monitoring that enables us to identify its disciplining effects on each municipality's level of corruption. We also perform balance tests of municipalities with timely audit assignment for a set of predetermined characteristics (adjusting for municipality and election fixed effects) to further examine the validity of the design. Municipalities under timely and untimely audits do not differ significantly in a large set of incumbent mayor, political, and socio-economic characteristics (see Appendix Table B.2, Panel B). This evidence supports the assumption that the timing of the audits can be considered exogenous and plausibly uncorrelated with unobserved determinants of municipal corruption levels.

To identify the spillover effect of norms within the peer group, we use a municipality's geographic location in the network of other municipalities and make the assumption that the peer group of officeholders in one municipality consists of (similar) officeholders in directly neighboring municipalities, defined as those that share a border with the home municipality. We then exploit variation in the share of neighboring municipalities that are subject to a timely audit during an incumbent's term in office. Unlike a direct measure of corruption in neighbouring communities using audit reports, this indirect measure is exogenous and still serves its purpose because timely audits elsewhere reduce contemporaneous levels of corruption in those communities. Thus, timely audits in neighboring municipalities result in an *exogenous decrease in neighboring corruption levels from the point of view of the home municipality.*[27] This exogenous reduction in neighboring corruption levels, observed by the office holder in the home community, generates the shock to corruption levels in neighboring jurisdictions that we observe.

Estimation. We estimate the average direct and external effects of the timely dissemination of audits on short-term levels of municipal government corruption using the following specification:

voters to place more weight on recent information (Berry and Howell, 2007; Lewis-Beck and Stegmaier, 2000). Our partition of mayors' terms into two-year windows is also supported by patterns in incumbent's corrupt behavior. For a more detailed empirical examination of this partitioning and further discussion, see Bobonis et al. (2016).

[26] In ancillary analyses (see Appendix Table AX) we show that the short-run effects are significantly stronger in municipalities in which local elections reflect a historical alternation of parties – there is no strong party incumbency advantage – a finding that supports the view that electoral accountability is an important explanatory mechanism.

[27] In column (5) of Appendix Table B.2, we verify that the share of timely audits in neighboring jurisdictions is orthogonal to own municipality characteristics. We find no significant relationships with audit characteristics – including whether an own municipality audit is timely or untimely – as well as with incumbent mayor and municipality-level political characteristics. With respect to socio-economic characteristics, the spillover exposure measure has a small correlation with greater population education levels, greater median incomes, and lower poverty rate at baseline; these differences should lead to minimal or no bias in our spillover effects estimates. In overall terms, these diagnostics support the identifying assumptions for the empirical analysis.

$$c_{m,t} = \beta \boldsymbol{A}_{m,t}^{(-m)} + \alpha A_{m,t} + \lambda X_{m,t} + \gamma_t + \rho_m + \epsilon_{m,t} \tag{15}$$

where $c_{m,t}$ denotes the number of corrupt violations per report in municipality m around election year t. $\boldsymbol{A}_{m,t}^{(-m)}$ measures the share of municipalities neighboring municipality m that receive a timely audit preceding election year t, and $A_{m,t}$ indicates whether or not the audit within municipality m was timely. $X_{m,t}$ is a vector of municipality and mayor characteristics that influence the municipality's level of corruption.[28] The terms ρ_m and γ_t represent municipality and election fixed effects respectively, and $\epsilon_{m,t}$ denotes unobserved characteristics that determine our measure of corruption at time t. Under the assumption that $\{A_{m,t}, \boldsymbol{A}_{m,t}^{(-m)}, X_{m,t}\}$ are strictly exogenous, the coefficients β and α are consistent estimates of the average external and direct effects, respectively, of timely audits on contemporaneous levels of reported corruption. We cluster standard errors at the municipality level.

Recall from our theoretical model that the direct effect of a timely audit in the home municipality should be negative: $\alpha < 0$. Moreover, the external effect of timely audits in neighboring municipalities—now represented by β—depends on the prevailing social norm: whether the majority of politicians in the incumbent's peer group is corrupt or not. Based on the average levels of municipal government corruption observed from our audit data (Table B.2, Panel A), politicians in the majority of municipalities do engage in corrupt behavior. According to our social norms model, when the majority is corrupt, a decrease in average peer corruption (as a result of timely audits in neighboring municipalities) would imply $\beta > 0$ due to the overall decreased social benefit of ethical behavior by the incumbent.

In addition to our baseline specification, we allow for external effects to differ by (a) whether the home municipality faces a timely audit or not, and (b) whether the incumbent mayor is in their first electoral term (new incumbent) or is a more experienced politician. We thus augment (15) by interacting the spillover exposure measure $\boldsymbol{A}_{m,t}^{(-m)}$ with the own municipality timely audit indicator ($A_{m,t}$) or with $N_{m,t}$, respectively, where the latter is an indicator for whether the mayor is a new incumbent. Lastly, we examine the audit program's direct and external effects on mayoral incumbents' re-election rates and corruption in the subsequent electoral term. Specifically, we estimate model (15) using $e_{m,t}$, an indicator for the re-election of the incumbent mayor in election year t, and $c_{m,t+1}$, the number of corrupt violations per report in municipality m around election year $t+1$, as the dependent variables.[29]

3.2 Results

Spillover Effects on Home Corruption. Table 1 presents the estimation results on spillover effects, separated by whether the dependent variable is corrupt violations of the mayor and vice-mayor only (left-hand panel) or of all elected municipal officials (right-hand panel). The baseline specification in columns (1)

[28] We use as controls the number of municipality government reports, the number of municipal public corporation or consortium reports; indicators for the mayor's membership in the PNP, for the incumbent being in the opposition party to the state-level executive government, and for the incumbent being in the opposition party to the governor who appointed the Comptroller; the vote share for the incumbent in the previous election; and whether the incumbent was in their first electoral term.

[29] When the dependent variable is $c_{m,t+1}$, we also control for whether there was a timely audit within the municipality in the subsequent electoral term, the share of adjacent municipalities with timely audits in the next election, as well as the relevant interactions with timely audit in the own municipality (in the next term) and new incumbent.

and (4) report the direct effects as well as the spillover effects from timely audits in adjacent municipalities on the number of corrupt violations in the home municipality. The estimates of the direct effects α_1 verify a systematic reduction in the number of corrupt violations in the municipality as a result of timely audits. For mayors and vice-mayors, the point estimate is 0.56, which represents a 70 percent drop compared to the 0.80 violations per audit report published after the election. The estimated direct effect for all officials implies 1.34 fewer reported corrupt violations in municipalities with timely audits compared to those whose audit reports were published after the election. The corresponding reduction in reported corruption is 67 percent, suggesting little difference in how mayors and other municipality officials respond to the audits.[30]

Our main coefficient of interest is the estimated spillover effect of timely audits in neighboring jurisdictions, which is also sizeable. The point estimate of β_1 for mayors and vice-mayors is 0.40, suggesting that their reported corruption would be 50 percent higher if all adjacent neighbors underwent a timely audit as compared to a situation where none did. To further illustrate the magnitude of the spillovers, we can compare municipalities in which the median share of neighboring jurisdictions have a timely audit (approximately 0.67) to those where no neighboring municipalities do so. We report these estimates in the bottom panel of the table. The point estimate of the spillover effect implies that exposure to timely audits in the median share of adjacent municipalities leads to an increase in reported corruption levels by 0.27 violations ($= 0.40 \times 0.67$) in the home municipality, or 34 percent relative to the control group mean. This estimated spillover is large and precisely estimated when we focus on the violations attributed to the municipal government leadership.[31] For all officials, the point estimates of the average spillover effects imply a weaker spillover effect, which moreover is not statistically significant (column 4).

The specifications in columns (2) and (5) examine heterogeneous spillover effects for home municipalities with untimely versus timely audits. We find that the spillover effects in home corruption are concentrated among municipalities with untimely audits and are mitigated by timely audits at home. The point estimates among municipalities experiencing untimely audits ((β_1) are negative for corruption attributed to both the mayor/vice-major and among all officials. The estimates imply that exposure to timely audits in the median share of adjacent municipalities leads to an increase in reported corruption levels by 28-46 percent relative to the mean of the control group. In contrast, the spillover effects among municipalities that themselves have timely audits ($\beta_1 + \beta_2$) are much muted and statistically indistinguishable from zero. These results are consistent with the different forces at play: (i) the incentive effects of own timely audits work mainly through reelection concerns, whereas (ii) incumbents facing untimely audits respond more strongly to neighboring audits through the reputational social image concerns.

[30] To check whether the effects are due to the mayor's electoral accountability, we estimate heterogeneous effects of audits by the competitiveness of the mayoral seats, using our summary measure of party incumbency advantage; see estimates in Appendix Table B.5 As expected, the short-term disciplining effects are concentrated among municipalities with competitive elections. The estimated impacts in competitive seat municipalities imply reductions in rent-seeking levels in the 80-95 percent range (in proportional terms), whereas the estimated effects among municipalities with a significant party incumbency advantage are in the 48-57 percent range.

[31] In an ancillary analysis, we evaluate whether the linear structure of the spillover effects represents a good approximation. Figure B.2 in the Appendix plots a bin scatter-plot of the data (residuals adjusting for municipality and electoral term fixed effects) showing the relationship between exposure to timely audits in neighboring jurisdictions and the number of violations by the political leadership in the home municipality. The semi-parametric relationship is appropriately summarized by a linear model, indicating that it is not variation in the extensive margin, any neighboring municipality having a timely audit, that is driving the results.

Table 1: Direct and Spillover Effects of Timely Audits on Number of Corrupt Violations in the Current Audit

	Dependent variables: Number of corrupt violations per report					
	Mayor/Vice-Mayor			All		
	(1)	(2)	(3)	(4)	(5)	(6)
β_1: Share of adjacent municipalities with timely audit	0.40**	0.56**	0.60***	0.30	0.84**	0.68*
	(0.17)	(0.27)	(0.18)	(0.31)	(0.40)	(0.37)
β_2: Share of adjacent municipalities with timely audit × Timely audit		-0.28			-0.95*	
		(0.32)			(0.48)	
β_3: Share of adjacent municipalities with timely audit × New incumbent			-0.46			-0.88*
			(0.31)			(0.53)
α_1: Timely audit	-0.56***	-0.39*	-0.49***	-1.34***	-0.78**	-1.27***
	(0.10)	(0.21)	(0.13)	(0.18)	(0.32)	(0.24)
λ_1: New incumbent	0.21*	0.21*	0.60**	0.34**	0.31**	1.00**
	(0.11)	(0.11)	(0.23)	(0.16)	(0.15)	(0.40)
Municipality Controls (λ)	Yes	Yes	Yes	Yes	Yes	Yes
Election Year and Municipality FE's	Yes	Yes	Yes	Yes	Yes	Yes
Spillover Effects Estimates:						
Share of adjacent municipalities with timely audit among interacted group ($\beta_1 + \beta_k$)		0.28	0.14		-0.11	-0.19
		(0.19)	(0.27)		(0.36)	(0.44)
Δ Outcome | 0 to median share of adjacent municipalities with timely audit						
(a) average or among reference group (β_1 × median(share))	0.27**	0.37**	0.40***	0.20	0.56**	0.46*
	(0.11)	(0.18)	(0.12)	(0.20)	(0.27)	(0.25)
(b) among interacted group (($\beta_1 + \beta_k$) × median(share))		0.19	0.09		-0.07	-0.13
		(0.12)	(0.18)		(0.24)	(0.29)
Observations	470	470	470	470	470	470
Mean of dep. variable (untimely audits)	0.80	0.80	0.80	2.00	2.00	2.00

Note: : Coefficient estimates and standard errors from OLS regressions are presented; disturbance terms are clustered at the municipality level. Coefficient estimates statistically significant at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ levels, respectively. Controls are the number of municipality government reports, the number of municipal public corporation or consortium reports; indicators for New Progressive Party membership, for incumbent in the opposition party to the state-level executive government, and for incumbent in the opposition party to the governor who appointed Comptroller; the vote share for the incumbent in the previous election (t-1); and the incumbent's number of terms in office (at time t). The specifications in columns 3 and 6 include an interaction term between timely audit (1/0) and being a new incumbent. To illustrate the magnitude of the estimated spillover effects, we compare municipalities in which the median share of neighboring jurisdictions have a timely audit (approximately 0.67) to those where no neighboring municipalities do so [beta x 0.67].

Since our data contain information on how many terms a politician has served in office, we can use incumbency as a proxy for the sensitivity of electoral prospects to behavior. Specifically, long-term incumbents plausibly would be politicians whose re-election chances are less sensitive to their behavior in the previous period. In contrast, voters should be more sensitive to behavior of incumbents who are yet unknown to them because they are in their first term in office. The main implication of the theoretical model is then that, because new incumbents face more competitive elections, they should be more responsive to electoral incentives relative to the reputation or self-respect (social) motive. Thus, we expect the coefficient on such interaction terms, β_3, to be negative: first term office holders should worry more about re-election than about reputation or self-image, and therefore react less to changes in corruption among neighboring communities than politicians who have been in office longer.

Columns (3) and (6) document how the spillover effects vary by the level of incumbency of the office holder. Note first that estimated corruption among new office holders is higher than among experienced incumbents; our estimate of λ is positive and statistically different from zero across specifications. Next, consider the estimates of the base spillover effect (β_1) and the interaction term (β_3), which estimates the differential spillover for municipalities with first-term incumbent mayors vs. those with long-term incumbents. For mayors and vice-mayors, the spillover effect point estimates suggest an increase of 0.40 corrupt violations, or 50 percent relative to the control group mean, among municipalities with more experienced incumbents (bottom panel). Although the differences are not statistically significant, the point estimates imply much smaller increases of 0.09 corrupt violations (11 percent) among municipalities with new incumbents; the latter estimates are statistically indistinguishable from zero. Similar results hold for violations by all officials. Here, the point estimate is an increase of 0.46 corrupt violations (23 percent) relative to the control group mean among municipalities with more experienced incumbents. In contrast, we find no evidence of spillover effects in municipalities with new incumbents. This observed heterogeneity can be rationalized through the lens of the theory if long-term incumbents place a relatively greater weight on social motives than first term incumbents, who face an electorate that are less sensitive to their behavior in the current term (including any information on this behavior revealed through audits).[32]

Spillover Effects on Home Re-Election Rates and Long-Term Corruption. Turning to short-term electoral accountability (incumbent mayors' re-election rates) and longer-term corruption levels, Table 2 reports estimates from linear probability models of equation (15) using $e_{m,t}$, an indicator for the re-election of the incumbent mayor in election year t, as the dependent variable. We keep our three specifications from Table 1. The point estimate on the average effect of timely audits on incumbent mayors' re-election rates is very small and not statistically different from zero (column 1). Recalling that officials adjust their behavior in response to timely audits and that citizens update their beliefs regarding the incumbent's performance following positive or negative audit outcomes, this result is consistent with political agency models. Note, however, that new incumbents have significantly lower re-election rates and that the effect is quite sizeable. Again, this is not surprising. After all, experienced mayors have already been re-elected once: being positively selected, they have safer seats. In addition, we found earlier that new incumbents tend to be more corrupt, and are thus more likely to be punished at the ballot box.

Our point estimates of the spillover effects indicate that a higher share of timely audits in neighboring

[32]This findings would be difficult to reconcile with a yardstick competition model. Since spillover effects operate through re-election chances in such a model, one would expect first-time office holders to react more strongly to changes in outcomes elsewhere.

jurisdictions (inducing less corruption) is associated with an increase in the incumbent mayors' probability of re-election (see column 1). As column (3) shows however, this positive relation is primarily driven by new incumbents who we found *not* to be increasing their corrupt behavior through spillovers. Median exposure to adjacent timely audits leads a substantial rise in the re-election probability of new incumbents by 14.4 percentage points, a 57 percent increase relative to the control group mean.

It is important to note that this finding is not inconsistent with the theory: specifically, we know from Table 1 that audits elsewhere increase corruption among experienced incumbents. This should decrease their electoral chances, ceteris paribus. At the same time, though, the electorate is now more confident about re-electing mayors for whom their posterior belief indicates a pro-social type and those incumbents will be re-elected more often. Ex ante, we can therefore not make unambiguous statements about how re-election rates are affected in general; however, if we have a subgroup of mayors (new incumbents) which we suspect to react less than the average incumbent to the spillover, we would expect their re-election rates to be higher than average due to the latter effect. The finding also reinforces the idea that the length of incumbency serves as a stratifying measure for politicians' sensitivity to re-election concerns: long-term office holders tend to be safer in office and we expect their electoral chances to be less sensitive to behavioral changes triggered by audits at home or elsewhere, whereas the opposite to be the case for new incumbents.

Our estimates of the effects of timely audits on subsequent corrupt violations are reported in columns (4)–(6). Although the sign of the point estimates for both the direct and external effects across all specifications are generally similar than in short-term analysis, they are considerably smaller and are imprecisely estimated.[33] This finding is also consistent with theory: the forces of electoral accountability and political selection, in conjunction with the short-run norms motives, lead to muted spillover effects of timely audits on political corruption.

[33]Bobonis et al. (2016) already show for a smaller sample period that the direct effect of timely audits is short-lived. We confirm this and show that the spillover effects exhibit similar fading out patterns. Analogous results hold when we examine all corrupt violations in the municipality, not just political corruption by the leadership.

Table 2: Direct and Spillover Effects of Timely Audits on Re-Election and Number of Corrupt Violations in the Subsequent Audit

	Dependent variables: Successful re-election of incumbent mayor			Number of corrupt violations per report (*t+4*) Mayor/Vice-Mayor		
	(1)	(2)	(3)	(4)	(5)	(6)
β_1: Share of adjacent municipalities with timely audit	0.097*	0.087	0.009	0.259	0.527	0.326
	(0.052)	(0.075)	(0.055)	(0.326)	(0.514)	(0.452)
β_2: Share of adjacent municipalities with timely audit × Timely audit		0.018			-0.525	
		(0.083)			(0.484)	
β_3: Share of adjacent municipalities with timely audit × New incumbent			0.207**			-0.195
			(0.091)			(0.402)
α_1: Timely audit	0.031	0.021	-0.002	-0.051	0.248	-0.038
	(0.027)	(0.055)	(0.034)	(0.096)	(0.288)	(0.164)
λ_1: New incumbent	-0.458***	-0.457***	-0.636***	-0.151	-0.149	-0.624
	(0.039)	(0.040)	(0.066)	(0.129)	(0.131)	(0.434)
Municipality Controls (λ)	Yes	Yes	Yes	Yes	Yes	Yes
Election Year and Municipality FE's	Yes	Yes	Yes	Yes	Yes	Yes
Spillover Effects Estimates:						
Share of adjacent municipalities with timely audit among interacted group ($\beta_1 + \beta_k$)		0.105*	0.216***		0.00	0.13
		(0.060)	(0.080)		(0.25)	(0.26)
Δ Outcome | 0 to median share of adjacent municipalities with timely audit						
(a) average or among reference group (β_1 × median(share))	0.065*	0.058	0.006	0.17	0.35	0.22
	(0.035)	(0.050)	(0.036)	(0.22)	(0.34)	(0.30)
(b) among interacted group ($(\beta_1 + \beta_k)$ × median(share))		0.070*	0.144***		0.00	0.09
		(0.040)	(0.054)		(0.17)	(0.17)
Observations	470	470	470	366	366	366
Mean of dep. variable (untimely audits)	0.253	0.253	0.253	0.69	0.69	0.69

Note: Coefficient estimates and standard errors from OLS regressions are presented; disturbance terms are clustered at the municipality level. Coefficient estimates statistically significant at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ levels, respectively. Controls are the number of municipality government reports, the number of municipal public corporation or consortium reports; indicators for New Progressive Party membership, for incumbent in the opposition party to the state-level executive government, and for incumbent in the opposition party to the governor who appointed Comptroller; the vote share for the incumbent in the previous election (t-1); and the incumbent's number of terms in office (at time t). The specifications in columns 3 and 6 include an interaction term between timely audit (1/0) and being a new incumbent. The specifications in columns 4-6 include controls for the share of adjacent municipalities with timely audits in the next election, as well as the relevant interactions with timely audit in the own municipality (in the next term) and new incumbent in columns 5 and 6, respectively. To illustrate the magnitude of the estimated spillover effects, we compare municipalities in which the median share of neighboring jurisdictions have a timely audit (approximately 0.67) to those where no neighboring municipalities do so [beta x 0.67].

Alternative Mechanisms. While our empirical results support the theory, they may also be consistent with other models of officeholder behavior, different from norm spillovers through social motives. Specifically, other prominent alternative explanations of the patterns we observe in the data would be yardstick competition and other spillovers in the transmission of information to citizens, a model where politician learns the effectiveness or salience of anti-corruption strategies from their peers, and the spatial displacement of corrupt activities. We discuss each in turn.

Yardstick competition and other models based on informational spillovers also imply that politicians' behavior is spatially linked. The main idea here is that the electorate is able to observe outcomes or policies from neighboring jurisdictions and can use this information to better hold their home office holders accountable. Translated to our context with corruption, consider the simplest possible yardstick scenario where voters observe public good levels in neighboring communities and can use this information – because the underlying determinants of public good levels are correlated across communities (e.g. economic growth) – in their own assessment of how likely it is that a high (respectively, low) level of public good provision at home indicates prosocial (respectively, anti-social) behavior of the incumbent office holder. There are two key properties of this model that do not fit our data. First, we know that audits in neighboring communities will decrease corruption there, which will tend to increase the level of public goods provided in those communities. Voters observing better outcomes elsewhere would rationally update their beliefs and be *less lenient* in the home community, assuming public good levels are positively correlated. This would put additional pressure on office holders to curb corrupt behavior and thus lead to a decrease in corruption. Put differently, in this situation audits elsewhere would re-enforce pro-social behavior at home rather than dampen it. Second, and equally important, the channel through which yardstick competition – and other models that have voters as the central mechanism of spatial spillovers – works is the electorate. This implies that the spillover effects should be more pronounced for new incumbents, who are plausibly facing a more sensitive electorate than long-term incumbents. Again, the data here suggest the opposite, indicating that electoral channels are unlikely to be the key to understand the patterns we find in the data.

Another channel of spatial spillovers could be through a learning effect, i.e., when neighboring audits help officeholders learn about either the effectiveness or the salience of the audit program. This is the most likely mechanism behind the findings by Avis et al. (2018) and Lichand et al. (2016) on audits in Brazil, who find positive spillovers. If learning were part of the explanation in our context, we would expect a similar complementary effect of audits elsewhere on corruption at home: we already know audits are effective and thus learning about their effectiveness would decrease the tendency of home officials to engage in corrupt action, contrary to what the data show.[34] The timing can also not be the culprit: we can rule out that audits elsewhere make home audits less likely since the timing is exogenous and we do not find a concrete relation between timely audits at home and in the neighboring communities (see Table B.6).[35]

[34]Data aside, learning models are unlikely to be applicable to our research setting for several reasons. First, unlike those studied in Brazil, the Puerto Rico audits are not randomized but instead follow a fixed order. Each municipality has been audited in the past, which makes an environment with learning less likely. Moreover, each municipality knows when they are to be audited, knows if the upcoming audit will be timely, and knows the approximate time period between audits. Thus, there is little additional information about the audit program to be gained from the presence of neighboring timely audits. Second, compared to Brazil–with over 5,500 municipalities–the odds of having a neighboring municipality timely audited among Puerto Rico's 78 municipalities are much larger. Thus, neighboring timely audits are not as rare an occurrence, making it also less plausible that behavioral arguments of audit salience apply in our setting.

[35]Another possibility is that politicians perceive their own audit to be more lenient if a lot of their peers are being audited as well. Using the number of separate audit reports issued for each municipal audit as an indicator of intensity, Table B.5 in the Appendix documents that there is no positive or negative correlation between adjacent audit exposure and home audit intensity.

Lastly, a possible explanation for our results could lie in the spatial displacement of corrupt activities (Lichand and Fernandes, 2019).[36] Corruption and patronage networks in this context are characterized by a highly polarized political equilibrium commonly found in highly divided societies (Magaloni, 2006; Stokes et al., 2013; Padró-i-Miquel, 2007). These are evident in intense allegiances to the territory's traditional political parties, and to a distribution of benefits to constituents largely based on such allegiances (Pantojas-García, 2015; Atiles et al., 2022; Bobonis et al., 2022). It is plausible that corruption networks could shift such activities across municipal borders to avoid detection in those experiencing timely audits. The data do not allow us to completely rule out this kind of channel. In particular, it is possible that corrupt individuals who approach public officials seeking favors in exchange for money simply go elsewhere when their home community faces an audit, which could lead to the negative spillovers we observe. However, many of the corrupt activities in our data (procurement fraud, nepotism, patronage, and misappropriation for personal gain) are arguably linked to a specific community or officeholder and – to the extent that they can be spatially displaced – one would expect the displacement to focus on the same political network. Thus, we should observe the spillover effects to be stronger among incumbents belonging to the same political party network as those in neighboring jurisdictions. The Appendix contains some results on spillover effects within versus across political party networks, and shows that spillovers happen irrespective of party connections. While our point estimates seem to be larger and more precisely estimated when neighboring incumbents are of the same party, the estimated effect on the complementary group is too imprecise for us to discern any statistically significant difference in effects when we consider all sources of corruption. Besides, if the peer group is more relevant within the same party, we would expect similar findings, so any evidence of heterogeneity would also consistent with a more nuanced interpretation of the norms model.

4 Conclusion

In this paper, we develop a model to better understand how formal and informal institutions interact in determining corruption. The model assumes that officeholders are motivated by both material and social concerns. The material payoffs depend on the direct benefit from rent-seeking as well as the cost associated with electoral scrutiny, which is further elevated when officeholders face audits. Formal institutions in the form of elections and audits thus operate to discipline officials and curb corruption. The social payoff of officeholders is formalized as their reputation or self-image, which in turn depends on the prevaling norm in their peer group. In particular, the theory predicts that in societies with high levels of corruption, formal institutions such as elections and audits that are designed to hold office holders accountable are not as effective because peer corruption and individual corruption are substitutes. Intuitively, if many officials in a politician's peer group are corrupt, what dominates their reputation or self-image payoff is the desire to stand out in the crowd by 'doing the right thing'. A drop in peer corruption as a result of anti-corruption measures dampens that desire and thus reduces the reputational or self-respect gain from the pro-social action. The social feedback loop then works in opposition to the direct effect of the formal anti-corruption measures. Conversely, in societies where corruption among officials is comparatively rare, elections or audits to improve accountability are more effective because peer corruption and individual corruption are complements. In those situations, the dominant factor in determining a politician's social payoff is the stigma of 'doing the

[36] Such an explanation is common in the context of studying the effects of policing and monitoring on crime. See, for instance, Dell (2015) and Blattman et al. (2021).

wrong thing'. A drop in peer corruption in this setting then further increases that stigma and the reputation or self-respect gain from the pro-social action. The social feedback loop works in the same direction as the formal incentives.

The conclusion is thus that how informal and formal institutions interact in affecting corruption depends on the norm in the society. If corruption is the norm, formal accountability measures are less effective ceteris paribus than if corruption is not the norm. Social incentives and material incentives are substitutes, not complements. The overall success rate of any anti-corruption initiative may well be dampened as a result. This effect could provide insights on why democracies such as Italy, Greece, Indonesia, Brazil, or Puerto Rico that have well-established formal institutions have nevertheless been comparatively unsuccessful in their fight against corruption, despite decades of formal anti-corruption measures. In contrast, societies with relatively low levels of corruption such as the United States, Canada, or other countries in Western Europe, all countries with very similar formal institutions than the former group, we would expect pro-social behaviors to reinforce each other and, thus, anti-corruption efforts to have more desirable spillover effects. The distinction is thus relevant to any policy aiming at a sustainable check on government corruption.

Applying the theory to the case of municipalities in Puerto Rico, we find data patterns that are consistent with the kind of substitutability between social and material motives identified in the model. In particular, using a quasi-random identification strategy, we show that spillovers in corruption exist between neighboring communities. Less corruption in the peer group of officials elsewhere – caused by increased scrutiny through formal audits – increases the level of corruption in the home community. Taking those findings as supportive evidence of the importance of the role of spillover effects, our argument would also imply, for example, that slow and gradual changes to the social norm, recommended by Acemoglu and Jackson (2017), may not succeed in the long run. Indeed, perhaps a sweeping jolt aimed at drastically curbing the social norm of corruption—enough to bring society out of a "corruption trap"—may be better positioned to succeed in bringing about a society where honorable behavior can spread and reinforce itself to become the social norm.

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Appendix A: Omitted Proofs

Equilibrium Existence. Note first that since Δ^S and Δ_i^R are positive, the right-hand side of (12) is less than b. Hence, any (θ_A^*, θ_N^*) that solves (12) must satisfy $\theta_i^* \leq b$, $i \in \{A, N\}$. Further, the left-hand side of (12) goes to negative infinity for $\theta \to \infty$. Thus there must exists a finite $\underline{\theta}_i$ such that for all $\theta_i^* < \underline{\theta}_i$, we have

$$\theta_i^* + \mu\Delta^S(\alpha_A\theta_A^* + \alpha_N\theta_N^*) < b - (1-\mu)(R+b) \leq b - (1-\mu)\Delta_i^R(\theta_i^*)(R+b),$$

where the last inequality follows from $\Delta_i^R(\theta_i) \leq 1$. Thus, any solution (θ_A^*, θ_N^*) must belong to the compact convex set $[\underline{\theta}_A, b] \times [\underline{\theta}_N, b]$. Noting that the left-hand side of (12) is increasing in θ_i^* while the right-hand side is decreasing in θ_i^*, the equation (12) implicitly defines a continuous and monotone function $f_i(\theta_{-i}^*) : [\underline{\theta}_A, b] \times [\underline{\theta}_N, b] \to [\underline{\theta}_A, b] \times [\underline{\theta}_N, b]$. A fixed point therefore exists, and is unique. □

Proof of Proposition 2. To show parts a) and b) on the comparative statics of α_A., we take derivatives of eqrefeqcutoff1,

$$\frac{d\theta_i^*}{d\alpha_A} \cdot \left[1 + (1-\mu)\frac{d\Delta_i^R(\theta_i^*)}{d\theta_i^*}(R+b)\right] = -\mu\Delta^{S'}(\tilde{\theta})\frac{d\tilde{\theta}}{d\alpha_A}. \qquad i = A, N, \tag{16}$$

where

$$\frac{d\tilde{\theta}}{d\alpha_A} = (\theta_A^* - \theta_N^*), \tag{17}$$

in the short run, and

$$\frac{d\tilde{\theta}}{d\alpha_A} = (\theta_A^* - \theta_N^*) + \alpha_A\frac{d\theta_A^*}{d\alpha_A} + \alpha_N\frac{d\theta_N^*}{d\alpha_A}. \tag{18}$$

in the long run. From the definition of $\Delta_i^R(\theta_i^*)$,

$$\frac{d\Delta_N^R(\theta_N^*)}{d\theta_N^*} = -(1-p)\psi \cdot \phi(\psi\underline{\delta}_N^1)\frac{d\underline{\delta}_N^1}{d\theta_N^*} > 0, \quad \frac{d\Delta_A^R(\theta_A^*)}{d\theta_A^*} = -\psi \cdot \phi(\psi\underline{\delta}_A^1)\frac{d\underline{\delta}_A^1}{d\theta_A^*} > 0.$$

Thus, $d\theta_i^*/d\alpha_A$ has the same sign as $-\Delta^{S'}(\tilde{\theta})d\tilde{\theta}/d\alpha_A$, and $d\theta_A^*/d\alpha_A$ and $d\theta_N^*/d\alpha_N$ always have the same sign.

Our assumptions on $G(\theta)$ imply $\tilde{\theta} \gtrless 0 \Leftrightarrow \Delta^{S'}(\tilde{\theta}) \gtrless 0$ (Jewitt, 2004). It immediately follows that in the short run, using (17),

$$\frac{d\theta_A^*}{d\alpha_A} \gtrless 0, \quad \frac{d\theta_N^*}{d\alpha_A} \gtrless 0, \qquad \text{for} \quad \tilde{\theta} \gtrless 0.$$

Next, consider the long run with (18). To show a) , note that since $\tilde{\theta} > 0$ by assumption, we have $\Delta^{S'}(\tilde{\theta}) > 0$, given our assumption on $G(\theta)$ (Jewitt, 2004). We then must have, using (17)

$$\frac{d\theta_A^*}{d\alpha_A} > 0, \quad \frac{d\theta_N^*}{d\alpha_A} > 0, \quad \text{and} \quad \frac{d\tilde{\theta}}{d\alpha_A} < 0. \tag{19}$$

This is because if $d\theta_A^*/d\alpha_A \leq 0$ and $d\theta_N^*/d\alpha_A \leq 0$, $d\tilde{\theta}/d\alpha_A \geq 0$ according to (16), a contradiction to $d\tilde{\theta}/d\alpha_A = (\theta_A^* - \theta_N^*) + \alpha_A d\theta_A^*/d\alpha_A + \alpha_N d\theta_N^*/d\alpha_A < 0$.

To show b), note that $\tilde{\theta} < 0$ implies $\Delta^{S'}(\tilde{\theta}) < 0$. Then $d\theta_A^*/d\alpha_A$, $d\theta_N^*/d\alpha_A$, and $d\tilde{\theta}/d\alpha_A$ all have the same sign. In this situation, either of the following cases is possible depending on parameters

1) $\frac{d\theta_A^*}{d\alpha_A} > 0$, $\frac{d\theta_N^*}{d\alpha_A} > 0$, and $\frac{d\tilde{\theta}}{d\alpha_A} > 0$;
2) $\frac{d\theta_A^*}{d\alpha_A} < 0$, $\frac{d\theta_N^*}{d\alpha_A} < 0$, and $\frac{d\tilde{\theta}}{d\alpha_A} < 0$.

It remains to show how $f(\cdot)$ affects $d\theta_i^*/d\alpha_A$. The right-hand side of equation (16) is fixed, implying that the absolute value $|d\theta_i^*/d\alpha_A|$ of $d\theta_i^*/d\alpha_A$ and the value of $d\Delta_i^R(\theta_i^*)/d\theta_i^*$ change in opposite directions. Recalling $d\Delta_N^R(\theta_N^*)/d\theta_N^*$ from (8) and noting that $d\Delta_A^R(\theta_A^*)/d\theta_A^*$ is also proportional to $f(\cdot)$, we can compare two officeholders with the same cutoffs θ_i^* and the same change $d\alpha_A$ in the peer group, but different $f(\cdot) > f'(\cdot)$ over the relevant parameter range. This implies $d\Delta_i^R(\theta_i^*)/d\theta_i^* > d\Delta_i^{R'}(\theta_i^*)/d\theta_i^*$ and the claim follows. In the extreme case $f(\cdot) \to 0$, an incumbent re-election chances no longer depend on his behavior: $d\Delta_i^R(\theta_i^*)/d\theta_i^* \to 0$, because both $\frac{d\underline{\delta}_N^1}{d\theta_N^*}$ and $\frac{d\underline{\delta}_A^1}{d\theta_A^*}$ are bounded. Therefore,

$$1 + (1-\mu)\frac{d\Delta_i^R(\theta_i^*)}{d\theta_i^*}(R+b) \to 1,$$

when $\psi \to 0$.□

Proof of Proposition 3. We already showed in the main text how officeholders' re-election probabilities change corruption when an audit is being anticipated. For result a), we only need to prove that the sign of $dE[P_i(r,\theta_i^*)]/d\theta_i^*$ is ambiguous. According to the discussion below equation (14), to show that the effect of θ_i^* on the ex ante probability of re-election is ambiguous, we only need to show that $d\underline{\delta}_i^1/d\theta_i^*$ is negative. This is true because

$$\frac{d\underline{\delta}_N^1}{d\theta_N^*} = -\frac{p(1-p)^2(1-G(b))g(\theta_N^*)}{[p+(1-p)(1-G(\theta_N^*))]^2}, \qquad \frac{d\underline{\delta}_A^1}{d\theta_A^*} = -\frac{(1-p)(1-G(b))g(\theta_A^*)}{(1-G(\theta_A^*)^2}.$$

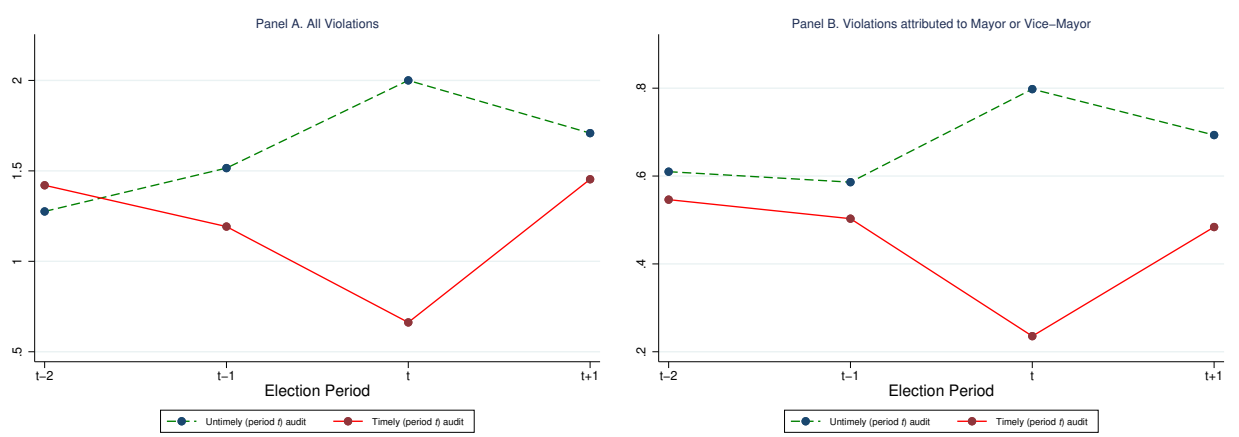
To prove result b), we first take the derivative of $E[P_i(r,\theta_i^*)]$ with respect to α_A and obtain

$$\begin{aligned}\frac{dE[P_i(r,\theta_i^*)]}{d\alpha_A} &= \frac{dE[P_i(r,\theta_i^*)]}{d\theta_i^*}\frac{d\theta_i^*}{d\alpha_A} \\ &= \left\{-g(\theta_i^*)\Delta_i^R(\theta_i^*) - [pG(\theta_i^*)\cdot\mathbb{I}_{i=N} + (1-G(\theta_i^*))]\, f(\underline{\delta}_i^1)\frac{d\underline{\delta}_i^1}{d\theta_i^*}\right\}\frac{d\theta_i^*}{d\alpha_A}\end{aligned}$$

which again is ambiguous because the first term is negative while the second term is positive due to $d\underline{\delta}_i^1/d\theta_i^* < 0$. Finally note that if $f(\cdot) \to 0$ over the relevant range of δ, we have $\Delta_i^R(\theta^*) \to 0$ and since $d\underline{\delta}_i^1/d\theta_i^*$ is bounded. $\left|\frac{dE[P_i(r,\theta_i^*)]}{d\alpha_A}\right| \to 0$.□

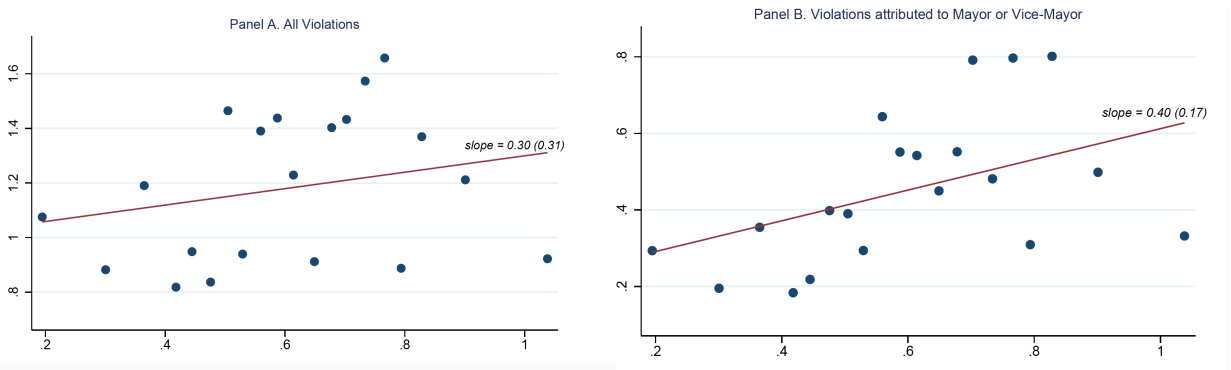
Appendix B: Additional Tables and Figures

Figure B.1: Average number of corrupt violations for municipalities with timely versus untimely audits



The figure shows the unadjusted relationship between the number of corrupt violations per report in each audit, for municipalities with timely and untimely audits around election time (t)

Figure B.2: Relationship between the Share of Adjacent Municipalities with Timely Audits and Corruption in Own Municipality



Bin scatter-plot of the data (residuals adjusting for municipality and electoral term fixed effects) showing the relationship between exposure to timely audits in neighboring jurisdictions and the number of violations by the political leadership in the home municipality.

Table B.1: Characteristics of the Audit Reports

	All (1)	Timely audit (2)	Untimely audit (3)	Difference (adjusted) (4)	Share of adj. municipalities w/ timely audit (5)	Observations (6)
Panel A: Audit outcomes						
Any corrupt violation	0.64	0.57	0.75	-0.15***	-0.07	470
	[0.48]	[0.50]	[0.44]	(0.06)	(0.11)	
Number of all corrupt violations per report	1.18	0.66	2.00	-1.27***	0.40	470
	[1.64]	[0.89]	[2.14]	(0.17)	(0.36)	
Number of violations by mayor/ vice-mayor	0.45	0.24	0.80	-0.54***	0.42**	470
	[0.89]	[0.50]	[1.21]	(0.10)	(0.19)	
Panel B: Other audit characteristics						
Number of audit reports	1.97	2.28	1.49	0.69***	0.02	470
	[1.23]	[1.37]	[0.74]	(0.12)	(0.29)	
Start of audit period in reports (years from election)	5.98	6.50	5.16	2.17***	-0.00	470
	[2.34]	[2.35]	[2.07]	(0.18)	(0.42)	
End of audit period in reports (years from election)	1.22	1.47	0.83	0.64***	-0.32	470
	[1.43]	[1.41]	[1.38]	(0.13)	(0.36)	
Time span of audited period (years)	4.76	5.04	4.33	1.52***	0.32	470
	[2.39]	[2.48]	[2.18]	(0.19)	(0.50)	
Share of adjacent municipalities with timely audit	0.60	0.63	0.56	-0.03	1.00	470
	[0.29]	[0.28]	[0.30]	(0.03)	(0.00)	
Observations	470	288	182	470	470	

Note: Standard deviations of variables in each category are reported in brackets. Differences in the means of the variables between municipalities with timely and untimely audits (column 4) and the correlation with the share of adjacent municipalities with timely audits (column 5) are estimated via ordinary least squares (OLS) regression models, regression-adjusted for municipality and electoral term fixed effects. Robust standard errors are clustered by municipality and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.2: Characteristics of the Municipalities

	All (1)	Timely audit (2)	Untimely audit (3)	Difference (adjusted) (4)	Share of adj. municipalities w/ timely audit (5)	Observations (6)
Panel A: Electoral Outcomes						
Incumbent mayor runs for reelection	0.77	0.78	0.77	-0.02	0.01	470
	[0.42]	[0.42]	[0.42]	(0.05)	(0.11)	
Incumbent party wins	0.34	0.36	0.31	-0.02	0.03	470
	[0.48]	[0.48]	[0.47]	(0.04)	(0.09)	
Incumbent mayor wins | running	0.28	0.30	0.25	-0.03	0.08	470
	[0.45]	[0.46]	[0.44]	(0.05)	(0.09)	
Panel B: Incumbent Mayor Characteristics						
Mayor, member of PNP	0.52	0.53	0.51	0.09*	0.15	470
	[0.50]	[0.50]	[0.50]	(0.05)	(0.09)	
Member of opposition party to governor	0.36	0.38	0.34	-0.02	-0.12	470
	[0.48]	[0.49]	[0.48]	(0.06)	(0.11)	
Member of opposition party to governor appointing comptroller	0.44	0.46	0.40	-0.02	-0.02	470
	[0.50]	[0.50]	[0.49]	(0.06)	(0.13)	
New incumbent	0.37	0.37	0.38	0.02	-0.14	470
	[0.48]	[0.48]	[0.49]	(0.06)	(0.13)	
Terms in office	1.35	1.47	1.16	0.25*	0.06	470
	[1.38]	[1.49]	[1.18]	(0.14)	(0.29)	
Mayor's win margin in previous election	0.03	0.03	0.02	0.00	0.00	470
	[0.04]	[0.04]	[0.03]	(0.00)	(0.01)	
Party incumbency advantage	0.57	0.57	0.58	0.01	0.01	470
	[0.49]	[0.50]	[0.50]	(0.05)	(0.14)	
Observations	470	288	182	470	470	

Note: Standard deviations of variables in each category are reported in brackets. Differences in the means of the variables between municipalities with timely and untimely audits (column 4) and the correlation with the share of adjacent municipalities with timely audits (column 5) are estimated via ordinary least squares (OLS) regression models, regression-adjusted for electoral term fixed effects. Robust standard errors are clustered by municipality and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.2: Characteristics of the Municipalities (*continued*)

	All (1)	Timely audit (2)	Untimely audit (3)	Difference (adjusted) (4)	Share of adj. municipalities w/ timely audit (5)	Observations (6)
Panel C: Pre-Audit Municipality Characteristics						
Share of population with high school education or more (1990)[a]	0.440 [0.076]	0.443 [0.074]	0.436 [0.079]	0.007 (0.009)	0.034* (0.018)	470
Share of population with college education or more (1990)[a]	0.105 [0.040]	0.107 [0.038]	0.103 [0.043]	0.004 (0.005)	0.015 (0.010)	470
Household median income (USD1,000s) (1990)[a]	8.220 [1.769]	8.231 [1.729]	8.203 [1.837]	0.030 (0.216)	0.992** (0.407)	470
Poverty rate (1990)[a]	0.613 [0.096]	0.610 [0.097]	0.617 [0.095]	-0.007 (0.010)	-0.050** (0.020)	470
Unemployment rate (first year of mayor's term)	0.161 [0.047]	0.157 [0.044]	0.169 [0.052]	0.002 (0.003)	-0.008 (0.010)	362
Unemployment rate (second year of mayor's term)	0.159 [0.046]	0.154 [0.044]	0.167 [0.049]	-0.001 (0.003)	-0.000 (0.007)	418
Observations	470	288	182	470	470	

Standard deviations of variables in each category are reported in brackets. Differences in the means of the variables between municipalities with timely and untimely audits (column 4) and the correlation with the share of adjacent municipalities with timely audits (column 5) are estimated via ordinary least squares (OLS) regression models, regression-adjusted for electoral term fixed effects. Robust standard errors are clustered by municipality and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.3: Spillover Effects of Timely Audits on Corruption by Incumbent Party in Adjacent Municipalities

	Dependent variables: Number of Corrupt violations per report by Mayor/Vice-Mayor		
	(1)	(2)	(3)
β_1: Share of adjacent municipalities of the same party with timely audit	0.33***	0.52**	0.42***
	(0.09)	(0.21)	(0.13)
β_2: Share of adjacent municipalities of the same party with timely audit × Timely audit		-0.31	
		(0.24)	
β_3: Share of adjacent municipalities of the same party with timely audit × New incumbent			-0.23
			(0.26)
β_4: Share of adjacent municipalities of opposition party with timely audit	0.19*	0.19	0.32**
	(0.11)	(0.18)	(0.15)
β_5: Share of adjacent municipalities of opposition party with timely audit × Timely audit		-0.01	
		(0.21)	
β_6: Share of adjacent municipalities of opposition party with timely audit × New incumbent			-0.29
			(0.26)
Own Timely Audit Control	Yes	Yes	Yes
Municipality Controls (λ)	Yes	Yes	Yes
Election Year and Municipality FE's	Yes	Yes	Yes
Spillover Effects Estimates:			
Test of homogeneous effects [p-value]:			
(a) average or among reference group incumbents (H_0: $\beta_1 = \beta_4$)	0.31	0.27	0.64
(b) among interacted group (H_0: $\beta_1 + \beta_k = \beta_4 + \beta_j$)		0.79	0.63
Δ Outcome | 0 to median share of adjacent municipalities with timely audit			
(a) mun.'s of the same party, all or reference group (β_1 × med(share))	0.17***	0.26**	0.21***
	(0.05)	(0.10)	(0.06)
(b) mun.'s of the same party, interacted group (($\beta_1 + \beta_k$) × med(share))		0.11**	0.10
		(0.05)	(0.10)
(c) mun.'s of the opposite party, all or reference group (β_4 × med(share))	0.09*	0.09	0.16**
	(0.05)	(0.09)	(0.08)
(d) mun.'s of the opposite party, interacted group (($\beta_4 + \beta_j$) × med(share))		0.09	0.02
		(0.06)	(0.10)
Observations	470	470	470
Mean of dep. variable (untimely audits)	0.80	0.80	0.80

Note: Coefficient estimates and standard errors from OLS regressions are presented; disturbance terms are clustered at the municipality level. Coefficient estimates statistically significant at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ levels, respectively. Controls are the number of municipality government reports, the number of municipal public corporation or consortium reports; indicators for New Progressive Party membership, for incumbent in the opposition party to the state-level executive government, and for incumbent in the opposition party to the governor who appointed Comptroller; the vote share for the incumbent in the previous election (t-1); and the incumbent's number of terms in office (at time t). To illustrate the magnitude of the estimated spillover effects, we compare municipalities in which the median share of neighboring jurisdictions have a timely audit (approximately 0.67) to those where no neighboring municipalities do so [beta x 0.67].

Table B.4: Effects of Timely Audits on Corruption, by Party Alternation vs. Party Incumbency Advantage

	Dependent variables: Number of corrupt violations per report			
	Mayor/Vice-Mayor		All	
	(1)	(2)	(3)	(4)
α_1: Timely audit	-0.77***	-0.78***	-1.59***	-1.62***
	(0.12)	(0.13)	(0.24)	(0.24)
α_2: Timely audit × Party incumbency advantage	0.39**	0.39**	0.45	0.48
	(0.15)	(0.16)	(0.29)	(0.30)
β_1: Share of adjacent municipalities with timely audit	0.41**	0.47*	0.29	0.55
	(0.16)	(0.24)	(0.30)	(0.39)
β_2: Share of adjacent municipalities with timely audit × Party incumb. adv.		-0.10		-0.46
		(0.30)		(0.48)
λ_1: Party incumbency advantage	-0.23	-0.17	0.06	0.33
	(0.14)	(0.20)	(0.27)	(0.32)
Municipality Controls (λ)	Yes	Yes	Yes	Yes
Election Year and Municipality FE's	Yes	Yes	Yes	Yes
Timely audits among municipalities with party incumbency advantage ($\alpha_1 + \alpha_2$)	-0.38***	-0.38***	-1.14***	-1.14***
	(0.13)	(0.13)	(0.22)	(0.22)
Observations	470	470	470	470
Mean of dep. variable (untimely audits)	0.80	0.80	2.00	2.00

Note: Coefficient estimates and standard errors from OLS regressions are presented; disturbance terms are clustered at the municipality level. Coefficient estimates statistically significant at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ levels, respectively. Controls are the number of municipality government reports, the number of municipal public corporation or consortium reports; indicators for New Progressive Party membership, for incumbent in the opposition party to the state-level executive government, and for incumbent in the opposition party to the governor who appointed Comptroller; the vote share for the incumbent in the previous election (t-1); and the incumbent's number of terms in office (at time t). Party incumbency advantage is a dummy variable for whether the incumbent's party won the previous 3+ elections in the municipality. To illustrate the magnitude of the estimated spillover effects, we compare municipalities in which the median share of neighboring jurisdictions have a timely audit (approximately 0.67) to those where no neighboring municipalities do so [beta x 0.67].

Table B.5: Heterogeneous Spillover Effects of Timely Audits on Number of Corrupt Violations by Levels of Corruption in Adjacent Municipalities

	Dependent variables: Number of corrupt violations per report			
	Mayor/ Vice-Mayor (1)	All (2)	Mayor/ Vice-Mayor (3)	All (4)
β_1: Number of timely audits in adjacent municipalities with party alternation	0.18***	0.24**	0.19**	0.33***
	(0.06)	(0.10)	(0.07)	(0.12)
β_2: Number of timely audits in adjacent municipalities with party alternation × New Incumbent			0.00	-0.20
			(0.12)	(0.18)
β_3: Number of timely audits in adjacent municipalities with party incumb. adv.	0.04	-0.05	0.10	-0.03
	(0.06)	(0.11)	(0.07)	(0.14)
β_4: Number of timely audits in adjacent municipalities with party incumb. adv. × New Incumbent			-0.13	-0.03
			(0.11)	(0.20)
λ_1: Number of audits in adjacent municipalities with party alternation	-0.04	-0.14	0.01	-0.10
	(0.09)	(0.15)	(0.09)	(0.15)
λ_2: Number of audits in adjacent municipalities with party alternation × New Incumbent			-0.12	-0.06
			(0.11)	(0.15)
λ_3: Number of audits in adjacent municipalities with party incumb. adv.	-0.01	0.03	-0.02	0.01
	(0.08)	(0.16)	(0.09)	(0.18)
λ_4: Number of audits in adjacent municipalities with party incumb. adv. × New Incumbent			0.05	0.06
			(0.08)	(0.19)
λ_5: New incumbent	0.21*	0.34**	0.51*	0.59
	(0.11)	(0.16)	(0.27)	(0.42)
α_1: Timely audit	-0.57***	-1.36***	-0.59***	-1.40***
	(0.10)	(0.18)	(0.10)	(0.18)
Municipality Controls (λ)	Yes	Yes	Yes	Yes
Election Year and Municipality FE's	Yes	Yes	Yes	Yes
Observations	470	470	470	470
Mean of dep. variable (untimely audits)	0.80	2.00	0.80	2.00

Note: Coefficient estimates and standard errors from OLS regressions are presented; disturbance terms are clustered at the municipality level. Coefficient estimates statistically significant at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ levels, respectively. Controls are the number of municipality government reports, the number of municipal public corporation or consortium reports; indicators for New Progressive Party membership, for incumbent in the opposition party to the state-level executive government, and for incumbent in the opposition party to the governor who appointed Comptroller; the vote share for the incumbent in the previous election (t-1); and the incumbent's number of terms in office (at time t). Party incumbency advantage is a dummy variable for whether the incumbent's party won the previous 3+ elections in the municipality. To illustrate the magnitude of the estimated spillover effects, we compare municipalities in which the median share of neighboring jurisdictions have a timely audit (approximately 0.67) to those where no neighboring municipalities do so [beta x 0.67].

Table B.6: Estimates of Spillover Effects of Timely Audits on the Number of Audit Reports

	Dependent variable: Number of audit reports		
	(1)	(2)	(3)
β_1: Share of adjacent municipalities with timely audit	0.01	-0.09	0.04
	(0.27)	(0.21)	(0.29)
β_2: Share of adjacent municipalities with timely audit × Timely audit		0.17	
		(0.34)	
β_3: Share of adjacent municipalities with timely audit × New incumbent			-0.07
			(0.36)
α_1: Timely audit	0.70***	0.60***	0.70***
	(0.11)	(0.21)	(0.11)
λ_1: New incumbent	-0.20*	-0.19*	-0.15
	(0.10)	(0.10)	(0.21)
Municipality Controls (λ)	Yes	Yes	Yes
Election Year and Municipality FE's	Yes	Yes	Yes
Spillover Effects Estimates:			
Share of adjacent municipalities with timely audit among new incumbents ($\beta_1 + \beta_k$)		0.08	-0.03
		(0.38)	(0.36)
Δ Outcome | 0 to median share of adjacent municipalities with timely audit			
(a) among all or experienced mayors (β_1 × median(share))	0.01	-0.06	0.03
	(0.18)	(0.14)	(0.19)
(b) among new incumbent mayors (($\beta_1 + \beta_k$) × median(share))		0.06	-0.02
		(0.25)	(0.24)
Observations	470	470	470
Mean of dep. variable (untimely audits)	1.49	1.49	1.49

Note: Coefficient estimates and standard errors from OLS regressions are presented; disturbance terms are clustered at the municipality level. Coefficient estimates statistically significant at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ levels, respectively. Controls are indicators for New Progressive Party membership, for incumbent in the opposition party to the state-level executive government, and for incumbent in the opposition party to the governor who appointed Comptroller; the vote share for the incumbent in the previous election (t-1); and the incumbent's number of terms in office (at time t). To illustrate the magnitude of the estimated spillover effects, we compare municipalities in which the median share of neighboring jurisdictions have a timely audit (approximately 0.67) to those where no neighboring municipalities do so [beta x 0.67].